1940
Y. 24 5

A FAWCETT PUBLICATION

SEPTEMBER

MECHANIX ILLUSTRATED

Reg. U.S. Pat. Off.

7TH TIGR

SEE PAGE 34

AIL-FIRST PLANE TO FLY
TLANTIC IN FIVE HOURS!

THE 500 POUND MONSTER GRABBED ME IN THE DARK!

A True Experience of Richard Kroener, Keeper of Gargantua, mighty gorilla owned by Ringling Bros. and Barnum & Bailey Circus

1. "**ONE NIGHT** I entered the compartment just outside Gargantua's cage on a routine check-up and forgot for a moment that Gargantua was always waiting to kill me. Suddenly, with crushing force, he grabbed my left shoulder.

2. "**ALMOST PARALYZED** with horror, I thought the end had come. Then I remembered the flashlight in my right hip pocket. I whipped it out and turned the bright beam full into Gargantua's cruel, glittering eyes.

3. "**FOR AN INSTANT** he glared into the hated light, then relaxed his grip and lumbered to the other side of the cage. Your dependable 'Eveready' *fresh* DATED batteries saved me from a horrible death that night. I will never be without them."

(*Signed*) *Richard Kroener*

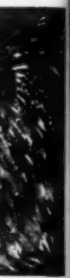
The word "Eveready" is a registered trade-mark of National Carbon Co., Inc.

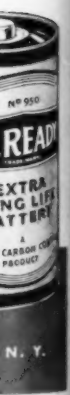
FRESH BATTERIES LAST LONGER... *Look for the* DATE-LINE

NATIONAL CARBON COMPANY, INC., 30 EAST 42nd STREET, NEW YORK, N. Y.

Unit of Union Carbide UCC *and Carbon Corporation*

ght I en-
ompart-
outside
cage on
heck-up
or a mo-
argantua
waiting
uddenly,
ng force,
my left





THIS EMPTY MEANS THIS EMPTY

It takes brain to earn money—trained brain! The man without training is usually the man without cash. You can train your brain! Thousands of men have done it through spare-time study of I. C. S. Courses. Be a cash man—be a trained man—mail this coupon!

INTERNATIONAL CORRESPONDENCE SCHOOLS

BOX 2323-U, SCRANTON, PENNA.

★ Without cost or obligation, please send me a copy of your booklet, "Who Wins and Why," and full particulars about the course *before* which I have marked X: ★

TECHNICAL AND INDUSTRIAL COURSES

- ☐ Agriculture ☐ Air Brake
- ☐ Air Conditioning
- ☐ Architectural Drafting
- ☐ Architecture
- ☐ Auto Engine Tune-up
- ☐ Auto Technician
- ☐ Aviation ☐ Boilermaking
- ☐ Bridge Engineering
- ☐ Building Estimating
- ☐ Chemistry
- ☐ Civil Engineering
- ☐ Coal Mining
- ☐ Concrete Engineering
- ☐ Contracting and Building
- ☐ Cotton Manufacturing
- ☐ Diesel Engines
- ☐ Electrical Engineering
- ☐ Electric Lighting
- ☐ Fire Bosses
- ☐ Fruit Growing ☐ Heating
- ☐ Heat Treatment of Metals
- ☐ Highway Engineering
- ☐ House Planning
- ☐ Locomotive Engineer
- ☐ Machinist
- ☐ Management of Inventions
- ☐ Managing Men at Work
- ☐ Manufacture of Pulp Paper
- ☐ Marine Engines
- ☐ Mechanical Drafting
- ☐ Mechanical Engineering
- ☐ Mine Foreman
- ☐ Navigation
- ☐ Patternmaking
- ☐ Pharmacy ☐ Plumbing
- ☐ Poultry Farming
- ☐ Practical Telephony
- ☐ Public Works Engineering
- ☐ Radio, General
- ☐ Radio Operating
- ☐ Radio Servicing
- ☐ R. R. Section Foreman
- ☐ R. R. Signalmen's ☐ Refrigeration
- ☐ Sanitary Engineering
- ☐ Sheet Metal Work
- ☐ Steam Electric
- ☐ Steam Engines
- ☐ Steam Fitting
- ☐ Structural Drafting
- ☐ Structural Engineering
- ☐ Surveying and Mapping
- ☐ Telegraph Engineering
- ☐ Textile Designing
- ☐ Toolmaking
- ☐ Welding, Electric and Gas
- ☐ Woolen Manufacturing

BUSINESS COURSES

- ☐ Accounting ☐ Advertising
- ☐ Bookkeeping
- ☐ Business Correspondence
- ☐ Business Management
- ☐ Cartooning
- ☐ Civil Service
- ☐ College Preparatory
- ☐ Commercial
- ☐ Cost Accounting
- ☐ C. P. Accounting
- ☐ First Year College
- ☐ Foremanship
- ☐ French ☐ Grade School
- ☐ High School ☐ Illustrating
- ☐ Lettering Show Cards
- ☐ Railway Postal Clerk
- ☐ Salesmanship ☐ Secretarial
- ☐ Service Station Salesmanship
- ☐ Sign Lettering ☐ Spanish
- ☐ Traffic Management

DOMESTIC SCIENCE COURSES

- ☐ Advanced Dressmaking
- ☐ Foods and Cookery
- ☐ Home Dressmaking
- ☐ Professional Dressmaking and Designing
- ☐ Tea Room and Cafeteria Management, Catering

Name..... *Age*..... *Address*.....

City..... *State*..... *Present Position*.....

Canadian residents send coupon to International Correspondence Schools Canadian, Limited, Montreal, Canada
British residents send coupon to I. C. S., 71 Kingsway, London, W. C. 2, England

NS

TUS EMPTY

★

ion

ial

3

PRICE
10 CENTS

MECHANIX ILLUSTRATED

SEPTEMBER
1940

Volume XXIV
Number 5

W. H. "BUZZ" FAWCETT, JR., President

Copyright 1940 by Fawcett Publications, Inc.

SPECIAL FEATURES

Los Angeles To London—Dawn To Dusk! - - 34
By Clarence L. Johnson

Heaven In His Own Back Yard! - - - - - 42

Diving With Death For Undersea Films! - - - 46
By J. Julius Fanta

Phones Show a Profit In Fun! - - - - - - - 51

Light Plane Directory - - - - - - - - - - 54

"Sub" Is Private Navy - - - - - - - - - 59

"Haunted Houses" Are Wired For Sound - - 60

Are These Germany's Secret War Weapons? - 66

Your Job—Accounting - - - - - - - - - 68
By Donald G. Cooley

Originality Makes a Firm Foundation! - - - 74

(Continued on page 6)

STILL GROWING! STILL 10 CENTS!

With the October issue, MECHANIX ILLUSTRATED increases its size 16 full pages, to bring you a magazine of no less than 162 interesting and informative pages—and there will be NO INCREASE in the popular price of 10 cents!

To you, our readers, who have made this increase possible through your whole-hearted acceptance of our efforts, we pledge the following platform:

Timely, exciting and informative feature articles—and plenty of them!

A larger and more varied assortment of interesting news shorts!

A bigger and better photo section for the camera fans!

A how-to-build section packed with clear-cut plans and drawings of everything from tiny kinks to boats that will weather the roughest storm!

That's our program, and we're proud of it! Our October issue, on the newsstands the 1st of September, is the Bandwagon number that you can't afford to miss!

We'll see you on board!

ROBERT HERTZBERG, Editor

Published monthly by Fawcett Publications, Inc., 11th Street and Broadway, Louisville, Kentucky. Executive Office—22 W. Putnam Avenue, Greenwich, Connecticut. Elliott D. Odell, Advt. Director; Roscoe K. Fawcett, Circulation Director; Ralph Daigh, Managing Editor; Al Allard, Art Director; Roland Cueva, George Daniels, Stanley Gerstin, Cliff Taylor, Associate Editors. Editorial and Advertising offices—1501 Broadway, New York. Send subscriptions to the Louisville, Kentucky, or Greenwich, Connecticut, addresses. Entered as second-class matter under the Act of March 3, 1879, at the post office in Louisville, Ky., with additional entry at Greenwich, Conn. Not responsible for unsolicited manuscripts. In U. S. and Possessions, 10c a copy; $1.00 a year. In Canada, 10c a copy; $1.50 a year. Other Postal Unions, $2.00 a year. Foreign subscriptions and sales should be remitted by International Money Order in United States funds, payable at Greenwich, Connecticut, U. S. A. East Indian Agent P. C. Eranee Sons, Bombay, India. Printed in U. S. A. Advertising forms close the first of second month preceding date of issue. Advertising offices: New York, 1501 Broadway; Chicago, 360 N. Michigan Ave.; San Francisco, Simpson-Reilly, 1014 Russ Bldg.; Los Angeles, Simpson-Reilly, Garfield Bldg. Member Audit Bureau of Circulations.

I Jumped My Pay from $18 to $50 a Week!

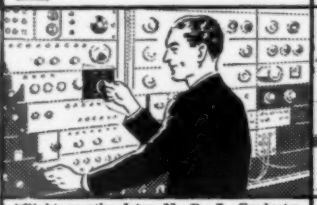
Here's how I did it

by S. J. E.
(NAME AND ADDRESS SENT UPON REQUEST)

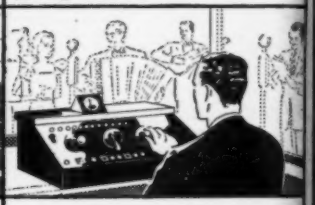
"I had an $18 a week job in a shoe factory. I'd probably be at it today if I hadn't read about the opportunities in Radio and started training at home for them."

"The training National Radio Institute gave me was so practical I was soon ready to make $5 to $10 a week in spare time servicing Radio sets."

"When I finished training I accepted a job as serviceman with a Radio store. In three weeks I was made service manager at more than twice what I earned in the shoe factory."



"Eight months later N. R. I. Graduate Service Department sent me to Station KWCR as a Radio operator. Now I am Radio Engineer at Station WSUI. I am also connected with Television Station W9XK."



"N. R. I. Training took me out of a low-pay shoe factory job and put me into Radio at good pay. Radio is growing fast."

J. E. SMITH, President
National Radio Institute Established 25 Years

Find out today how I Train You at Home to BE A RADIO TECHNICIAN

If you can't see a future in your present job, feel you'll never make much more money, if you're in a seasonal field, subject to lay offs, IT'S TIME NOW to investigate Radio. Trained Radio Technicians make good money, and you don't have to give up your present job or leave home to learn Radio. I train you at home nights in your spare time.

Why Many Radio Technicians Make $30, $40, $50 a Week

Radio broadcasting stations employ engineers, operators, technicians. Radio manufacturers employ testers, inspectors, foremen, servicemen in good-pay jobs. Radio jobbers, dealers, employ installation and servicemen. Many Radio Technicians open their own Radio sales and repair businesses and make $30, $40, $50 a week. Others hold their regular jobs and make $5 to $10 a week fixing Radios in spare time. Automobile, Police, Aviation, Commercial Radio; Loudspeaker Systems, Electronic Devices are other fields offering opportunities for which N. R. I. gives the required knowledge of Radio. Television promises to open many good jobs soon.

Many Make $5 to $10 a Week Extra in Spare Time While Learning

The day you enroll, I start sending you Extra Money Job Sheets which start showing you how to do Radio repair jobs. Throughout your Course I send plans and directions which have helped many make $5 to $10 extra a week in spare time while learning. I send special Radio equipment to conduct experiments and build circuits. This 50-50 training method makes learning at home interesting, fascinating, practical. I ALSO GIVE YOU A MODERN, PROFESSIONAL ALL-WAVE, ALL-PURPOSE SET SERVICING INSTRUMENT to help you make money fixing Radios while learning and equip you for full time work after you graduate.

Find Out What Radio and Television Offer You—Mail Coupon

Act Today! Mail the coupon for my 64-page book, "Rich Rewards in Radio." It points out Radio's spare time and full time opportunities and those coming in Television; tells abut my Course in Radio and Television; shows more than 100 letters from men I have trained, telling what they are doing and earning. Read my money back agreement. MAIL COUPON in an envelope or paste on a penny postcard—NOW!

J. E. SMITH, President,
Dept. OJH, National Radio Institute,
Washington, D. C.

MAIL NOW · Get 64 page book FREE

J. E. SMITH, President, Dept. OJH,
National Radio Institute, Washington, D. C.

Mail me FREE, without obligation, your 64-page book, "Rich Rewards in Radio." (No salesman will call. Write plainly.)

Age.....

Name .....

Address .....

City..... State.....

For Be
or E

Written s
understand
by well
neers and
De Luxe
ing nearly
1,546 blue
and diagra
you for a
job in m
architect
Sent for 1
use if you
immediatel

These Inst
Included

American
Send for 1
few cents
and over yo
after 10 da
is paid.
consulting

NAME ----

ADDRESS
Please atta
address and

Lear

Practical,
Includes A
Generation,
plan to me
largest tra
good pay j
while learn

Nati

AU
ACCREDITED

(approved
Engineeri

AERO
Curtiss-Wri

Practic

PA

IN

tain p
ence
to pro
in pat
tunitie
confid

309 S

DRAFTING

BOOKS SENT FREE!
ON APPROVAL
5 VOLUMES SECOND EDITION

For Beginners or Experts

Written so you can understand every word, by well known engineers and architects. De Luxe flexible binding nearly 2,000 pages, 1,546 blueprints, charts and diagrams; prepares you for a good drafting job in mechanical or architectural lines. Sent for 10 days' free use if you mail coupon immediately.

Only 15 minutes a day with these WONDER BOOKS can prepare you for a good drafting job. Mechanical and architectural drafting from simple straight lines to important complex plans. A step at a time! Built especially for beginners, for men with only grammar schooling. Drafting room practice, PLUS ENGINEERING, made easy and clear. Includes complete information on blue print reading for building and machine trades.

Big Field Big Demand Big Pay

Competent draftsmen are urgently needed in all building and manufacturing lines at $30.00 to $75.00 a week. That's just the beginning—FOR DRAFTSMEN HAVE GOOD CHANCES FOR ADVANCEMENT. Pleasant, fascinating work, easy to learn and do. Learn quickly with these books—send coupon for a set and see for yourself.

A year's consulting membership in the American Technical Society now given to all buyers of this famous cyclopedia of drafting.

These Instruments Included

Complete set of high grade drawing instruments if you send for these drafting books NOW. These instruments are accurate and are packed in velvet lined leatherette pocket case. Splendid value, but included with these books.

AMERICAN TECHNICAL SOCIETY
Publishers—Home Study Courses
Dept. D6320, Drexel at 58th St., Chicago, Ill.

American Technical Society, Dept. D6320, Drexel at 58th St., Chicago
Send for 10 days' trial, 5 volume set of drafting. I will pay the few cents delivery charges. If I wish, I may return books in 10 days and owe you nothing, but if I decide to keep them, I will send $2.00 after 10 days, then only $3.00 a month until $24.80, the total price is paid. Send latest edition and include drawing instruments and consulting Membership Certificate.

NAME _____

ADDRESS _____
Please attach letter stating age, occupation, employer's name and address and that of at least one business man as a reference.

Learn AUTO-DIESELS

Practical, tested training. Backed by 35 years experience. Course includes Auto Mechanics, Diesel Service and Operation, Diesel Power Generation, Machine Shop Practice, Auto Electrics, etc. Flexible plan to meet specific needs of those with or without jobs. Oldest, largest trade school in West qualifies you and helps you get a good pay job. Transportation allowed to L.A. Earn room and board while learning. Request Free Catalog.

National Schools Dept. MMA-9 LOS ANGELES

Opportunities in Aviation Greater NOW Than Ever Before

A. U. graduates with all leading aircraft manufacturers and airlines. Certified Mechanics (approved by U. S. Civil Aeronautics Authority), Drafting, Engineering, Administration. Days. Evenings. Free Bulletin.

AERONAUTICAL UNIVERSITY
Curtiss-Wright Bldg., 1338 S. Michigan Ave., Dept. E, Chicago, Illinois

Practical Facts You Will Want to Know About

PATENTS TRADE MARKS COPYRIGHTS

INVENTORS! If you are working on a new device or idea — send for our free booklets. They contain practical information based on 65 years' experience as patent attorneys. These books will tell you how to protect your invention, explain the necessary steps in patent procedure and describe the various opportunities for capitalizing on your invention. All inquiries confidential and answered immediately.
Write for free books today.

• C. A. SNOW & CO.
Registered Patent Attorneys Since 1875
309 Snow Building Washington, D. C.

CONTENTS—Continued from page 4

DEPARTMENTS

Chips From The Editor's Workbench - - - 10

Popular Patents - - - - - - - - - - 18

Through The Periscope - - - - - - - - 24

Moneymakers and Moneysavers (Classified Ads) - - - - - - - - - - - - - 27

You're Right—That's Wrong! - - - - - - 65

AVIATION

Los Angeles To London—Dawn To Dusk! - 34

Too Big To Keep Indoors - - - - - - - 40

Starter's Understudy—Is a Truck - - - - 50

Light Plane Directory - - - - - - - - - 54

New Metal Plane Won't Tailspin - - - - 58

NEW MECHANICAL DEVICES

The Blackboard Is Now Green - - - - - 40

Tanks For The Ferry Ride - - - - - - - 40

Tenting Tonight—On The Baggage Rack - - 41

100 Hour Pocket Radio - - - - - - - - 44

These Doughnuts Are Not Sinkers - - - - 44

It's An Old Shell Game! - - - - - - - - 45

She'll Go Far—On One Gallon - - - - - - 45

Portable Filter For Thirsty Campers - - - 50

Modern Slumber In a Bedinette - - - - - 53

New "Eyes" For Hams With Television Bug - 58

A New Aid For Paralytics - - - - - - - 73

Here's The Wheel The Ducks Duck - - - 73

(Continued on page 8)

INVENTORS

for Quick Action

SEND TODAY

MAIL COUPON NOW
TO CLARENCE A. O'BRIEN
Registered Patent Attorney
BEFORE U. S. PATENT OFFICE

CLARENCE A. O'BRIEN, Adams Building, Dept. OJ3, Washington, D. C.

Please send me your Free 48-Page "Patent Guide" and your specially prepared "Record of Invention" form. This request does not obligate me.

Name .....

Address .....

City ..... State .....

(PLEASE WRITE OR PRINT PLAINLY)

Get Free 48-PAGE BOOK

on How to Obtain PATENT and Market Inventions

If you have invented something, if you are interested in inventing something, you need our new 48-page book that gives the entire Story of Patents. It tells you for the first time about new phases of invention, how others succeeded, how the patent laws protect you, how to market your invention, where to obtain finances, how to form a company, partnership, or arrange for royalties from your invention's sale.

BE SURE TO PROTECT YOUR RIGHTS

The U. S. A. is the greatest open market for new inventions in the world. Here commercial striving is so keen that the unprotected invention, if it has public acceptance, is quickly "eyed" and may become the prey of eager competition. Worthwhile manufacturers will not bear the production costs and sales expense of promoting a new invention unprotected by patent. A good, strong patent not only opens the road to marketing your invention but closes it to would-be chiselers who may seek to reap the rewards of your creative efforts.

FREE FORM FOR RECORDING INVENTION

When you send for our FREE Patent Guide, we include, also Free, our specially prepared Record of Invention blank, on which you can quickly make and date a sketch and description of your invention. This "disclosure" as it is called, may be absolutely invaluable as evidence for you, should your rights ever be contested. Be sure to get it and use it.

LET US HELP YOU WITH YOUR PATENT

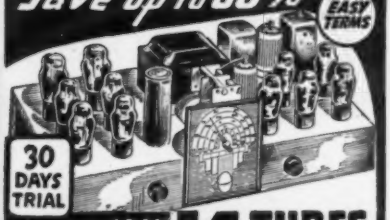
During the past twenty years we have helped great numbers of inventors secure their U. S. Patents. We know the pitfalls and how to avoid them. We have trained, experienced patent draftsmen and registered patent attorneys ready to serve you—and each one, when he undertakes to handle your case, realizes that he is personally responsible to contribute the fullest individual effort possible.

GET FREE BOOK—MAIL COUPON NOW

Know exactly what you should do to secure a Patent—what must be done every step of the way—how the Patent Law protects you—what we, as Registered Patent Attorneys, can do for you. Mail the above coupon NOW for our 48-page Patent Guide and Record of Invention Form.

CLARENCE A. O'BRIEN
REGISTERED PATENT ATTORNEY before U. S. PATENT OFFICE
ADAMS BUILDING, DEPT. OJ3, WASHINGTON, D. C.

FACTORY-TO-YOU
Save up to 50%
EASY TERMS



30 DAYS TRIAL

PUT THIS 1941 CHASSIS IN YOUR OWN CABINET

14-TUBES AMAZING FOREIGN RECEPTION

FREQUENCY MODULATION AND TELEVISION PROVISION

AT **$19.95** COMPLETE WITH TUBES AND SPEAKER

NOW, you can enjoy the mighty power of a 14-tube 1941 radio at the amazingly low factory-to-you price of $19.95. Brilliant performance—beautiful tone. Now, tune in broadcasts **direct** from distant overseas stations.

SEE MIDWEST'S ANSWER TO TRADE-INS!

Big 1941 catalog shows how to buy at wholesale price . . . direct from factory. Read about sensational-new 14-tube cabinet model at $29.95. Also other chassis and cabinet models from 5 to 17-tubes . . . up to 5 wave bands . . . including Radio-phonograph-combinations and Home Recorder.

FREE RADIO CATALOG

SEND 1¢ POST CARD FOR FREE 1941 CATALOG NOW!

USER-AGENTS Make Extra Money!

MIDWEST RADIO CORPORATION
DEPT. 19-AA CINCINNATI, OHIO

REAL JOBS OPEN!
FOR TRAINED AUTO MECHANICS
8 WEEKS' SHOP COURSE!

AUTO, DIESEL and **AVIATION** Mechanics, welding, body & fender taught with real tools, on real equipment, in 2 biggest, best schools of their kind in the world. Step into Big Pay—$35-$60 a week. Low tuition cost! Pay for part of course later! **FREE BOOK!** Send for Big, Free Opportunity book and new low rate—write nearest school **TODAY!**

McSWEENY SCHOOLS Dept. N-8 Detroit, Mich. Kansas City, Mo.

BUY BY MAIL

It's a time-saver and a money-saver to do business with the reliable direct-mail companies advertising on these pages. For hard-to-get merchandise particularly, shop these columns.

FREE SAMPLES TO GARAGE MEN AND MECHANICS

New TRIPLE-X NON-BREAKABLE PISTON RING

We'll send a sample absolutely free and postage prepaid to show the sensational new replacement piston ring invention. It is self-locking, unbreakable, more quickly installed, guaranteed for 100,000 miles and costs you far less than other replacement rings. Rush your name on a penny post card for Free Sample, price list, discounts, and guarantee. Rush.

TRIPLE-X ENG. CO., Dept. 629, 3801 S. Racine Ave., Chicago, Illinois

ELECTRICAL CAREERS

Become a Bliss technician in one year—ready to take advantage of increasing opportunities in the electrical field. Bliss men, today, fill key positions in many different electrical industries. All received the same course in fundamental theory and practice.

Modern laboratories. Successful placement. 48th year. Ask for free vocational chart. 299 Takoma Ave., Wash. D. C.

BLISS ELECTRICAL SCHOOL

CONTENTS—Continued from page 6

HOW TO BUILD SECTION

Introduction - - - - - - - - - - - 77

Bonnie, 18 Foot Plywood Sloop - - - - - 82

Hollow Spars Easily Made - - - - - - - 87

Canoe Rack For Automobile - - - - - - 88

Nautical Merry-Go-Round - - - - - - - 89

Boat Trailer - - - - - - - - - - - - 90

Gardener's Lawn Chariot - - - - - - - 91

Decorative Compartment Trays - - - - - 92

Portable Picnic Outfit - - - - - - - - 94

Modernizing The Sink - - - - - - - - 96

Household Kinks - - - - - - - - - - 97

Safe Campfires - - - - - - - - - - - 98

Wake Up By Radio! - - - - - - - - - 100

One Dollar Mantel Clocks - - - - - - - 101

Kinks For The Rural Dweller - - - - - - 102

Wooden Men Water The Lawn - - - - - 104

Stained Wood Folding Table - - - - - - 105

Sportsman's Gun Cabinet - - - - - - - 106

Disc Cigarette Box - - - - - - - - - 107

Kinks For The Motorist - - - - - - - - 108

Helpful Hints For The Home Owner - - - 110

Modern Style Magazine Rack - - - - - - 112

Speedy Sidewalk Snake-Scooter - - - - - 114

PHOTOGRAPHY

Fun With Your Camera At 1/250 - - - - - 78

Kinks For Photo Fans - - - - - - - - - 80

Heavy Duty Tilting Head - - - - - - - - 81

W

1.
m
lu
I
m
jo
fo
se
I'
e
th
th
jo
a

D
y
the o
thinks
Sta
hopes
out o
right
It's
busine
them!
becau
gratef
—of t
Yo
"come

LASALL

I am am
send me
☐ Execu
Mana

Name

Position

Address

WHICH OF THESE MEN IS YOU?

Is This You? OR *Is This You?*

1. "My name is Stark. I'm never late mornings. I get back promptly from lunch—often work overtime cheerfully. I carefully do every single job they give me and in six years I have done each job so many times that I'm letter-perfect! Only one little raise so far, but some day I ought to get a good one. I'm probably the steadiest, most loyal employee in the whole office. One of these days the boss will realize that I'm the best man who ever worked on this job. *Then* I'll show these other fellows a thing or two!"

2. "My name is Baker. I've only been here a year, but the jobs they give men like Stark and me are too easy. In three months I saw I could never get far ahead on routine work like this. So I began to look for ways to increase and improve the work in my department. I'm taking home-study training that's helping me a lot. My boss heard about it and complimented me. Next month I'm going to be made Assistant Department Head at 40% more money. After that—well, we'll see. But you can bet I'm still studying!"

DON'T you recognize both these men in your office? One is a slow plodder—the other an energetic go-getter. Stark thinks of himself—Baker, of his company.

Stark runs along comfortably in a rut—*hopes* for a big raise. Baker pulls himself out of ruts—*gets* a big raise. And goes right on training for *another* one!

It's men like Baker who turn to LaSalle business training because of what it *gets* them! And they know it gets them *plenty* because the proof is plain to read in the grateful letters—and the successful lives—of thousands of LaSalle graduates.

You too can join the ranks of the "comers" like Baker if you'll "train on the job you've got—to get the job ahead!" It all depends on you—the height of your ambition and your readiness to investigate, then study systematically and seriously.

The LaSalle Success Road is cleared and ready for earnest adults—has been traveled for thirty years. Its first sign-post has always been a man's name on a coupon like the one below.

It costs absolutely nothing to send such a coupon. But sending it may mean the turning-point in your whole life. Mail it! At least *find out* about LaSalle's road to better jobs—more money—success! There's no time like *NOW!*

LASALLE EXTENSION UNIVERSITY, A *Correspondence Institution*
Dept. 9493-R, CHICAGO

I am ambitious like Baker. Tell me how I can prepare for larger success—and send me your free booklet on the field I have checked below:

☐ Executive Management ☐ Law: LL.B. Degree ☐ Accounting ☐ Salesmanship ☐ Traffic Management

*Name*_____ *Age*_____

*Position*_____

*Address*_____

LaSalle EXTENSION UNIVERSITY
A CORRESPONDENCE INSTITUTION

Chips FROM THE Editor's Workbench

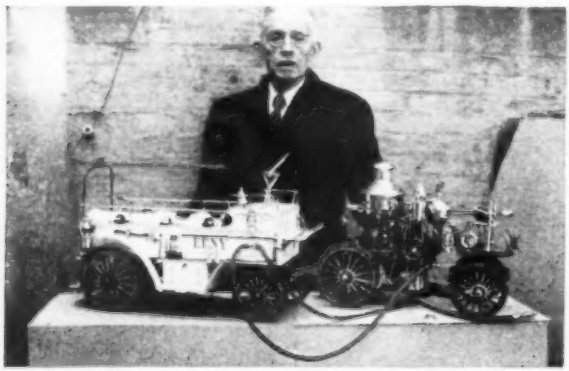
Send in photos of your completed workshop projects. Each month MECHANIX ILLUSTRATED awards a first prize of $5.00 for the best photo and letter received by this department and prizes of $3.00 each for all other photos and letters used. Be sure your name and address are clearly written or printed on the pictures. Send all such contributions to Editor, MECHANIX ILLUSTRATED, 1501 Broadway, New York, N. Y.

Horn Blowing

MORE pages in your favorite magazine next month! Yes, your response in purchasing MI permits us to give you still more for 10 cents. Commencing with the October issue, this magazine will have 162 pages—and the price remains the same! This unquestionably makes MI the biggest value in the mechanical magazine field.

I have one little favor to ask of all our faithful readers. *Please tell your friends about the new and enlarged MI.* Tell them to pick up their copies from their local newsdealers, who will have extra supplies. Don't give away your own copy, because you probably won't get it back. Drop a broad hint to would-be borrowers that a thin dime won't strain anybody's budget.

With more space at our disposal, we'll be able to present an even greater variety of feature articles and shop projects than before. Are you interested in some particular subject on which you'd like to see more information? Drop me a line about it and we'll look into the matter.



Three years of painstaking craftsmanship went into the construction of these really beautiful models of an old style fire engine and its hose wagon. Thirty-two wooden patterns for castings were made, followed by intricate machine work, polishing, painting, etc. The builder didn't have much trouble with various details of the machinery (all of which actually operates, by the way), because he was in command of the fire company that used the full-size originals in Brooklyn, N. Y., from 1895 to 1922! Our compliments and congratulations (and also our first-prize check of $5.00) go to Peter F. Gleason, retired captain, Fire Department, New York, of 241 East 4th Street, Brooklyn, N. Y. The only thing that's missing is the horses!

The Sky's The Limit

A few years ago, when any writer dared to predict flying speeds of 300 or 400 miles per hour, he was dismissed as a harmless crank with too vivid an imagination. Today, however, when the chief research engineer of one of the largest airplane factories in the world promises that we will soon be hitting 500 miles per hour, and backs up his prediction with cold engineering data, surely the matter has passed the fiction stage. That's why I know every reader will enjoy the lead article in this issue, written by Clarence L. Johnson of the Lockheed Company.

Very interesting also is the suggestion that the considerable amount of heat that now goes to waste in gasoline engines be utilized to run steam engines coupled to the same propeller shafts driven by the former.

* * *

"Your Jobs" Series Ends

The installment in this issue on accounting concludes the "Your Job" series prepared by Donald G. Cooley. Containing a wealth of sensible, helpful information, this material has been hailed by vocational guidance directors, teachers and employment managers all over the country. Mr. Cooley has been especially commended for his frankness in describing the disadvantages as well as the advantages of particular professions. With nothing to "sell" but honest advice, he has helped many an ambitious young man get started properly in the job for which he appears best fitted.

If you missed the earlier chapters, you'll be glad to know that copies of the various issues of MI containing them are still available. The complete list of installments, according to the issues in which they appeared, is as follows:

Auto Mechanic.....January, 1940
Radio Serviceman.....February, 1940
Photographer.....March, 1940
Airplane Pilot.....April, 1940

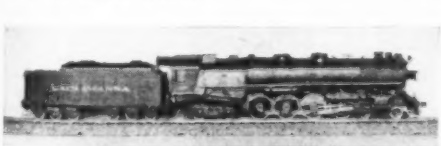
[*Continued on page* 12]

Editor's Workbench Chips

Here are some more examples of readers' handicraft. Why not send in pictures of *your* favorite projects? See opposite page for details.

When L. K. Wood, of Mendon, Utah, decided to build a model of the famous old Case traction engine (used extensively on western farms at the turn of the century), he also decided that he would have none of that baby stuff. The result is a five-foot long, 200-lb. giant "model" that burns coal and develops 1½ real horse power. It has more than 2,000 parts, practically all of them made by hand. Mr. Wood will receive a Workbench award of $3.00, which should buy him enough coal to run the machine for a couple of months.

The model Coast Guard cutter which we described in the November, 1938 issue was a pretty complicated job, involving many tiny fittings and fixtures. Curtis Englund, 2319 Arthur Street, N. E., Minneapolis, Minn., took it as something of a challenge to his skill, and he has just sent in this picture of his completed model. It's a very attractive piece of work, and surely deserves the $3.00 Workbench award that he will receive.



With nothing else in the picture to give size comparison, no one can tell whether this is a snapshot of a model or of a real locomotive. Actually, it's a model only two feet long, but so realistic that it fools everyone. It was made by L. W. Schaper, 279 Roseville Avenue, Newark, N. J., who bought only the motor, the driving wheel castings, the coupler and the bulb for the headlight. The rest he made himself. The scale is ¼" to the foot.

"I find your magazine exceedingly interesting and especially enjoy the workshop projects, which I like to read even though I do not make all of them," writes Mr. Schaper, who wins a $3.00 Workbench award for his interesting letter and photograph.

I Pity Such a Man, Don't You?

I KNOW a man 25 or 30 years old... a high school graduate at least... maybe he's even had a year or two of college. Got his first job some years back. Moved ahead pretty well for a while. Everyone liked him. But now he seems "stuck" . . . getting nowhere. Looks as if he'll never earn $50 a week. Friends tell him that lack of **specialized** education—**promotion training**—may be his trouble, but he won't let home study help him because he says, **"I have no money."** He eats, he clothes himself, he goes to movies, he smokes—but he HAS NO MONEY to protect himself against ever-increasing lay-offs—no money to surround his wife with such tokens of affection as only the steadily employed, well paid man can afford—no money to educate his children—no money to bring himself the TRAINING to make him a better man.

I pity such a man, don't you?

HE has **"no time."** No time to spare from movies, magazines and radio programs. No time to avoid frequent lay-offs and "out of a job" periods—no time to escape from LONG YEARS of hard, insecure work and trudging in a rut. No time to get the training to FREE HIMSELF from a SLAVE'S LIFE.

I pity such a man, don't you?

HE is **"not interested."** Not interested in the fact that he looks shabby while his friends are well dressed. Not interested, though he must walk while his friends ride in their own cars. Not interested, though his boss wonders if **he** can be kept on the payroll, while **other men** are being considered for PROMOTION. Not interested in the fact that he is acquiring a "hangdog" look—the look of a FAILURE. Not interested in the TRAINING that will give him **new interest** in life—that will make HIM **interesting** to his family and to his friends. "Not interested!"

I pity such a man, don't you?

"I HAVE No Faith!" He doesn't *say* it, but he might just as well SHOUT IT for all the world to hear. By his attitude he proclaims, "I have no faith in myself. No faith in my ABILITY. No faith in my INTELLIGENCE . . . to grasp home study lessons that 40 years of experience have simplified for me. No faith in my STICK-TO-IT-IVENESS . . . in my COURAGE to start a self-betterment program and **see it through.** No faith in my country. No faith in humanity. No faith in the future. In short, NO BACKBONE!"

I pity such a man, don't you?

I Envy This Man, Don't You?

I KNOW a young man who says, "Life has been pretty good to me." He is active socially, bowls every Friday during the season, is secretary of his church organization. As a boy, he had to quit before finishing high school, but he won his Diploma by studying at home three nights a week. Everyone respects him.

I envy such a man, don't you?

HIS first job was errand boy and sweeper. But his employer said, "His intelligence and earnestness are PROVED by his home study—I'll give him a little promotion and see how he stands it." Do you think that **'test promotion'** made him quit studying when he completed his home study high school course? It did not! He realizes, "High school education is not **job** training—I need a vocational course, too, if I am to continue my progress." In other words, he is willing to face the FACTS of life.

I envy such a man, don't you?

AND his studies are carrying him ahead. He has had 4 promotions in 5 years. He owns a good car. He is buying his home. Studying, in his SPARE time, those job facts that interest him intensely. **Enjoying** life. Admired. Respected. A credit to himself and his family. He says, **"It all started the day I mailed a coupon to American School, Chicago!"**

Promotion Begins at Home—Mail Coupon TODAY for FREE Facts

American School, Dept. G-628, Drexel Ave. at 58th St., Chicago
Send free information as checked below. No obligation.

— HIGH SCHOOL COURSE	— Air Conditioning
— Accounting and Auditing	— Diesel Engineering
— Architecture and Building	— Drafting and Design
— Automotive Engineering	— Liberal Arts
— Business Management	— Private Secretary
— Aviation	— Mechanical Engineering
— Electrical Engineering	— Radio and Television
— Electric and Gas Refrigeration	— Home Economics Courses

Name .....

Address .....

INVENTORS
PATENT YOUR IDEAS
SEND FOR FREE BOOK

HOW TO OBTAIN A PATENT

Written by a Former Member of the Examining Corps (1922-24) of the U.S. Patent Office. If you want to profit by your idea, you should take steps to apply for a U. S. Patent at once. Your first step is to get this Free Book. This interesting illustrated book contains valuable information you should have. It tells you fully how to obtain a patent on your idea in the quickest way. With this Free Book you will also receive a "Record of Invention" form on which you can easily record your idea. Personal and Confidential Service: Your case will be personally handled only by a Registered Patent Attorney who is also a Former Member of the Examining Corps of the U. S. Patent Office. All communications confidential.

MAIL COUPON TODAY for FREE PATENT BOOK and RECORD OF INVENTION Form

CARL MILLER
REGISTERED PATENT ATTORNEY
FORMER MEMBER EXAMINING CORPS U. S. PATENT OFFICE

Woolworth Bldg., 35th Floor, Dept. 90-B, New York City
MILLER BUILDING, Dept. 90-B, WASHINGTON, D. C.
Please send me your Free Book, "How to Obtain a Patent," and your "Record of Invention" form.

NAME .....

ADDRESS .....

PATENTS
PERSONAL SERVICE

My Personal service assures strictest confidence on all your patent problems. Send me a model or drawing, or sketch and description of your invention, and $5.00. I will make a search and report promptly as to its patentability and send you a copy of my 72-page booklet. Or, if you prefer to read my booklet first, write today for FREE copy. Registered Patent Attorney.

L. F. Randolph, 761 Victor Building, Washington, D. C.

INVENTORS

GET MY NEW FREE BOOK. Use my personal, confidential patent service. Send for free facts on patenting your invention. Also suggestions on financing a patent application. Reasonable fees. Deferred payments arranged. Write HUGH E. McMORROW, Registered Patent Attorney, 139-A Barrister Building, Washington, D. C.

WANTED INVENTIONS

WE LOCATE BUYERS for and have many requests from manufacturers for New Inventions of merit, Patented or Unpatented, Cash or Royalty. If will sell, write us today for a FREE PROTECTIVE DISCLOSURE FORM, Descriptive Booklet, References and Full Particulars of our services to inventors. NO OBLIGATION. A post-card will do! Address:

THE INVENTION REPORTER
2E-11236 So. Fairfield Ave., Chicago, Ill.

Inventions Wanted
Patented or Unpatented

We have been successfully selling inventions, patented and unpatented, since 1924. Write us, if you have a practical, useful idea for sale.

CHARTERED INSTITUTE of AMERICAN INVENTORS
Dept. 5, Barrister Building Washington, D. C.

Editor's Workbench Chips

[*Continued from page* 10]

We are continually receiving suggestions from readers dealing with other uses for small washing machine motors. It remains for J. Kelly, of Bristol, Va., to suggest a really practical use for the washing machine itself. This photo shows how he converted the sturdy frame into a thoroughly substantial base for a lathe bench. With the front removed, he was able to install three drawers which are very handy for keeping the lathe's accessories. A $3.00 Workbench check is going to Reader Kelly for his letter and picture.

Airplane Mechanic.....May, 1940
Draftsman.....June, 1940
Mechanical Engineer.....July, 1940
Electrical Engineer.....August, 1940

Back copies cost fifteen cents each. Order from the Circulation Department, Fawcett Publications, Inc., Fawcett Building, Greenwich, Conn.

* * *

Household Kink

Here's one for the ladies! If you want to keep the walls of your house clean, keep them warm. This advice is offered by R. A. Nielsen, a Westinghouse research engineer, who investigated dirt distribution in suburban Pittsburgh homes during the past winter. "Thermal precipitation" is the fancy name given to the effect, which often results in walls showing a pattern of the laths and framing behind them.

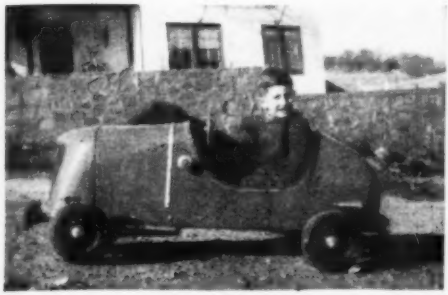
It seems that the molecules of oxygen and nitrogen in the air are in constant motion; the higher

[*Continued on page* 13]

This comfortable little kayak cost only $10.00, but is giving its builder, Rudy Targos, 132 Third Street, Passaic, N. J., more pleasure than he can ever measure in terms of money. He used the plans that appeared in the No. 4 edition of HOW TO BUILD 20 BOATS. Thanks for sending us this fine picture, Rudy; you'll receive a Workbench check for $3.00 for your trouble.

Editor's Workbench Chips

[*Continued from page 12*]



"Herewith is a picture of my son Jim and his one-lunger car which 'we' made," writes Shirley Clemens, of Sutter Creek, Cal. "The hood and radiator shell are from a '34 Dodge. The front axle is of the Ford Model T type. The motor is under the hood. Jim certainly is the envy of the kids in our little town!"

This is an exceptionally neat little runabout and rates a $3.00 Workbench prize.

the temperature, the more they swirl around. When the wall is warm there is a layer of warm air next to it, and these molecules move faster than those nearer the center of the room. Thus, they keep the dirt particles away. But when the room is hotter than the wall, Dr. Nielsen finds, the molecules near the cool wall are moving more slowly and the dirt particles are driven against it. Insulation in the walls helps considerably in preventing too marked a temperature difference.

[*Continued on page 14*]

"Here is a shot of a dummy fireplace I made from scrap wood and plaster of paris," writes William G. Harting, 608 11th. Street, Union City, N. J. "The whole thing cost about $3.25. The end decorations were also made from scrap wood. They are the fruit cart and reindeer sleigh, described in the December 1939 issue of MECHANIX ILLUSTRATED. The logs in the fireplaces are varnished, and look real swell when the bulb behind them is turned on."

This fireplace is a decorative addition to the house, and earns Builder Harting a Workbench award of $3.00.

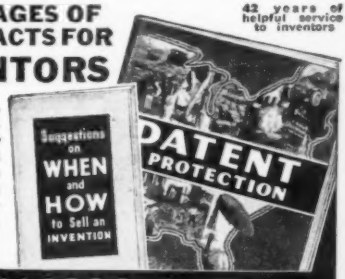
DON'T FORGET THIS:
A little idea may have big money-making possibilities!
PATENT and SELL your INVENTION
Act now!
U. S. Patent Laws favor the first to act. Delay may be costly. Write us today.

BUSINESS today is eager for practical, new manufacturing ideas. Opportunity for men with inventive talent was never greater than it is right now. If you have an idea for a new device—no matter how simple it may be—or for the improvement of an article now in use, find out AT ONCE how you can protect your rights to it and proceed to commercialize it. These two advisory books offered you without cost, may prove invaluable to you. Send for them NOW.

68 PAGES OF FACTS FOR INVENTORS

42 years of helpful service to inventors

Plainly written, easily understood. Tell you how to apply for patent protection; give six basic methods of selling your invention. Get them TODAY.



VICTOR J. EVANS & Co.

One of World's Largest Firms of Registered Patent Attorneys

MAIN OFFICE: 580-K VICTOR BUILDING, WASHINGTON, D. C.

Pittsburgh Office: 514-B Empire Building

Please send me immediately without charge or obligation, your two advisory books and your "Evidence of Invention" form.

Name .....

Address .....

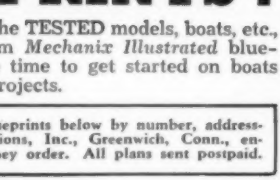
City ..... State .....

Why Not Work From

BLUEPRINTS?

Here are a few of the TESTED models, boats, etc., you can build from *Mechanix Illustrated* blueprints. Now is the time to get started on boats or other outdoor projects.

Order any of the blueprints below by number, addressing Fawcett Publications, Inc., Greenwich, Conn., enclosing check or money order. All plans sent postpaid.



MOUNTAIN LAKE SKIFF—A sturdy, simple 12-foot skiff made of waterproof plywood. Light enough to transport easily, yet strong enough to carry a good load. *Blueprint No.* 923 .....$1.50

YUMPING YIMMINY—Fast 27-inch model speedboat powered with miniature gas engine. Performs like the real thing. *Blueprint No.* 315 $2.00

SUNRAY JR.—A National Triangle Class racer. Very simple and inexpensive to build, this boat is ideal for the beginner who wants a *real* boat within his capabilities. L. O. A. 13' 9". Beam 52". Can be planked or plywood covered. *Blueprint No.* 920.....$2.00

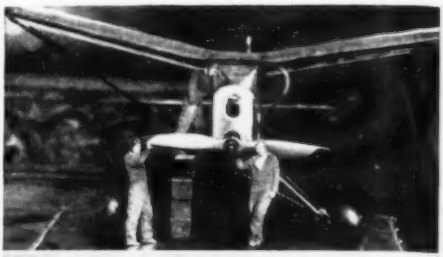
POWERED BIKE—Using an ordinary bicycle frame, this sturdy little bike is easy to build and assemble, and will give exceptionally satisfactory results. Any motor of from ½ to 1½ h.p. may be used. Plans show gear ratio table. *Blueprint No.* H-72 .....$1.50

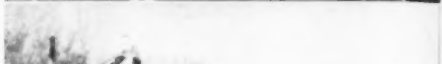
BARBARA-Q—14-foot utility outboard runabout, ideal for family use, camping or fishing trips. Takes any motor from 5 to 16 h.p. *Blueprint No.* 929 .....$2.50

MIDGE—Very light, strong 7-foot pram dinghy suitable for boat tender, or may be used as sailing and rowing dinghy. *Blueprint No.* 927 .....$1.00

Editor's Workbench Chips

[*Continued from page* 13]





That plane seems to be getting a lot of service, doesn't it? Look more closely and you'll ask, "What's it doing on top of a table?" This trick shot was sent in by Herlf Huso, of Aneta, North Dakota, and shows him in three different poses. The plane is a model, of course.

Herlf does all right on full-size projects, too. The bottom picture shows the enclosed snow sled he used all of last winter. This is a wind-driven job, with a converted Model A Ford engine.

For these two interesting pictures, Herlf will receive a Workbench prize of $3.00.

More Light

Considerable comment on the part of readers was aroused by the article entitled, "Why Electric Power Lines Are Grounded," which appeared in the April, 1940, issue of MI. While this contained much valuable and helpful data, it was not intended to be a complete technical treatise on a complicated subject. Many readers wrote in to say that they were revamping their home and shop circuits for better protection as the author suggested, and some asked for more information. We are therefore glad to quote the following from a letter written to reader Andrew Vena by G. R. Milne, outside plant engineer of the Consolidated Edison Company of New York:

"The main reason for grounding low voltage alternating current circuits which are supplied by transformation from higher voltage systems, is to avoid the possibility of imposing high voltage on low voltage circuits in case of a breakdown and connection between the high and low windings of a transformer. Assuming a 2,400 to 120/240 volt transformer, if the secondary is not grounded

[*Continued on page* 15]

Editor's Workbench Chips

[*Continued from page* 14]

and a defect occurs in the transformer between the primary and secondary windings, voltages as high as 2,400 volts would be impressed on the secondary system and thereby on the house circuits, with attendant danger to persons and the probability of failure of the building wiring. The voltage which would be impressed on the building wiring vary 0 to 2,400 volts, depending on how the primary system was grounded and at what particular point the primary and secondary windings in the transformer come together. If the secondary is grounded, however, the voltage to ground on the secondary system will not increase above the normal voltage to ground of that system no matter at what point the primary winding touches the secondary. The secondary winding and a reasonably good ground connection should remain continuous during such an occurrence, as it is of considerably greater thermal capacity than the primary. For the above reasons the National Electric Code and other regulatory bodies require on alternating current systems that the service be grounded at the service entrance, preferably to a water pipe.

"On overhead systems it is of course necessary to ground in order to keep the voltage to ground of such systems down to reasonable values during lightning disturbances and thereby prevent flashovers with interruption and possible equipment damage. Similarly, grounding the overhead

[*Continued on page* 16]

"I am sending you a picture of a scooter I made," writes C. C. Curvey, Route 5, Clinton, Ill. "It is powered with a ¼ h.p. Briggs & Stratton motor and is equipped with hand accelerator, clutch and foot brake. The chassis is an oak board reinforced with angle iron. The gas tank holds one gallon and this is good for at least eighty miles."

That's inexpensive transportation! A $3.00 Workbench check is going to reader Curvey for his letter and picture.

THINK OF YOUR FUTURE

AND GET INTO

ELECTRICITY

TRAIN FOR YOUR

START IN THIS

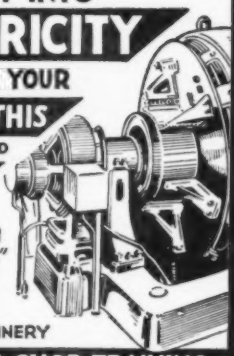
GROWING FIELD

A QUICKER

EASIER

WAY "LEARN BY DOING"

ACTUAL WORK ON ACTUAL ELECTRICAL MACHINERY



12 WEEKS SHOP TRAINING

PAY AFTER GRADUATION

If you are not getting ahead—if your dreams for the future are not panning out and you really want to get ahead—quit dreaming and do something about it. Get into a field where the opportunities are great and better salaries are paid. Get into Electricity.

The huge billion dollar Electrical Industry is full of opportunities for men and young men who are prepared to take advantage of them. Build the foundation for a better job or a business of your own in this growing field by training. You must be trained to get ahead.

The famous Coyne Shops in Chicago can train you for your start in only 12 weeks — NOT by home study BUT ON REAL ELECTRICAL EQUIPMENT and you "**Learn by Doing**".

YOU DON'T NEED PREVIOUS EXPERIENCE

You don't need previous experience—you don't need advanced education. At Coyne you are trained on real motors, dynamos, generators.

You wind armatures, do house wiring, operate switchboards, work on electric refrigeration and air conditioning equipment, farm lighting plants, automobile ignition and many other branches of Electricity.

EXTRA 4 WEEKS RADIO COURSE INCLUDED

Right now along with my regular Electrical Course **I am including an Extra 4 Weeks Radio Course at no extra tuition charge.**

"PAY AFTER GRADUATION" PLAN

I have a plan **to help ambitious fellows who are short of money for their tuition.** On this plan you can get your training **first** — then pay for most of it later in 12 monthly payments **starting 5 months after you start school, or 60 days after your training period.**

SEND THE COUPON FOR MY BIG FREE CATALOG AND ALL THE FACTS—TODAY!

H. C. LEWIS, President

COYNE ELECTRICAL SCHOOL

500 So. Paulina St. Dept. 60-53, Chicago, Ill.

MAIL COUPON TODAY

H. C. LEWIS, PRESIDENT,
COYNE ELECTRICAL SCHOOL
500 S. PAULINA ST., DEPT. 60-53,
CHICAGO, ILLINOIS

Please send me your big free catalog and all the facts about Coyne Training and about your Extra 4 Weeks Radio Course.

NAME.....

ADDRESS.....

CITY..... STATE.....

AVIATION Wants More LINCOLN TRAINED MEN

Advance employment orders now exceeding our available graduates. Airlines, Airplane Factories, Aviation Operators are calling on this **LINCOLN GOVERNMENT APPROVED SCHOOL** for more trained men. Airlines calling for advanced trained Pilots. Training centers calling on us for Flight Instructors.

A TOP RANKING U. S. SCHOOL

Lincoln's Primary and Advanced Flight Training, Government Approved, prepares for Gov't. Ratings and responsible flying position. Large fleet of Training Planes.

TRAIN FOR AN AIRLINE MECHANIC'S POSITION. Government Approved Training prepares for Gov't. Ratings and immediate employment as Airline Maintenance Mechanic. Short term courses prepare for job in Airplane Factory.

BE AN AERONAUTICAL ENGINEER. Learn to design and build airplanes. Our students getting actual experience. Big demand for Engineers.

NOW IS THE TIME TO TRAIN for Aviation! Opportunities the best they've ever been. Good Pay! Rapid advancement! Our Placement Department assisting Graduates into fine positions. Now offering part-time employment for board and room while in training. Act quickly!

MAIL COUPON NOW for Information

LINCOLN AERONAUTICAL INSTITUTE, (INC.)
LINCOLN AIRPLANE & FLYING SCHOOL DIVISION
529 Aircraft Building, Lincoln, Nebraska

I'd like to get ready for a job in Aviation as soon as I can. Please rush complete information about Lincoln Training.

Name..... Age.....

Address .....

City..... State.....

AIRCRAFT WELDING ENGINEERING

Industry Offers Outstanding Opportunities to properly trained **Commercial Welding Engineers** (1 year), **Welding Technicians** (5 months), **Aircraft Welders and Arc Welding Operators** (3 months). Learn By Doing. Earn Part Expenses—Write for free 64-page illustrated Book—"Dawn Of A Giant Industry." Mention course desired.

MILWAUKEE SCHOOL OF ENGINEERING
940MI—N. BROADWAY & E. STATE, MILWAUKEE, WIS.

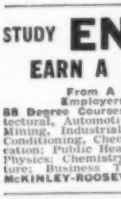
BUSINESS AND PERSONAL STATIONERY AT BARGAIN PRICES!

See MONEYMAKERS & MONEYSAVERS (pages 27-32) for good low-cost printing.

STUDY ENGINEERING AT HOME
EARN A DEGREE AT HOME

From A Chartered Institution Of Higher Learning
Employers Demand Degree Men For Key Positions

88 Degree Courses in Electrical, Civil, Mechanical, Drafting, Architectural, Automotive, Steam, Diesel, Aeronautical, Radio, Structural, Mining, Industrial, Highway, Petroleum, Marine, Refrigeration, Air Conditioning, Chemical Engineering; Arts; Sciences; Philosophy; Education; Public Health; Medical Jurisprudence; Psychology; Sociology; Physics; Chemistry; Geology; Pol. Science; Theology; Law; Agriculture; Business Training; Accounting; Statistics. Founded 1908.
McKINLEY-ROOSEVELT, 4750-B Sheridan Road, Chicago



BE A RAILWAY TRAFFIC INSPECTOR WRITE TODAY

Give Your Spare Time for a Good Job

In a few months' home study you can qualify as **Railway and Bus Passenger Traffic Inspector** and be eligible for a position paying up to $135 per month to start, plus expenses. We place graduates or **refund tuition.** Get Free Booklet describing our 21 yrs' service in this work.

STANDARD BUSINESS TRAINING INSTITUTE
Div. 6109 Buffalo, N. Y.

Editor's Workbench Chips

[*Continued from page* 15]

service where it enters a building helps further to drain off any lightning voltage which attempts to enter the building wiring. These comments apply only to overhead distribution systems and as you have pointed out do not apply to that portion of the New York City distributing systems which are underground as lightning is not a problem on the latter type of system.

"On direct current distribution system, however, which are of low voltage, 120/240 volts, grounding at the service is prohibited. Here the entire distribution system is underground and low voltage. If grounds are applied at the house service entrances, electrolysis troubles become excessive, due to the passage of direct current on the neutral, passing in and out of the various ground connections. The protection of the direct current distributing system from the high alternating voltage is accomplished by grounding the system at the various direct current substations where the transformation is made from high to low voltage and conversion made to direct current."

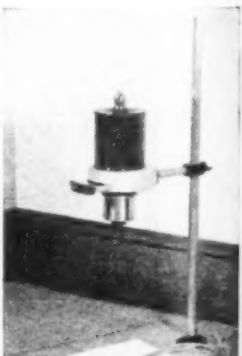
* * *

No Cause For Alarm

Some Americans are in a dither because so many Army and Navy fighting planes are being released to European powers. "We're weakening our own defenses just to cover up British lack of preparedness," they are complaining.

There's quite another side to the picture that is not generally appreciated. First of all, many of the exported planes are slightly on the antiquated side, and we should be glad to be rid of 'em. For instance, the Northrop A-17 single-

[*Continued on page* 17]



This neat enlarger, intended for use with half-vestpocket size negatives, cost Ray Houck, 630 West Lafayette St., Norristown, Pa., only $1.50. How did he do it so cheaply? Well, the support is an old shaft, set in a pipe flange. The lamp housing is a large tobacco can. The negative carrier section consists of built-up plywood. The focussing tube is a drinking cup, with the lens in the closed end. Ray says that he received a lot of help from the various enlarger articles that have appeared in MECHANIX ILLUSTRATED. He wins a $3.00 Workbench prize for his contribution.

Editor's Workbench Chips

[*Continued from page 16*]

engine 250-m.p.h. hedgehoppers are now about seven years old and are to be replaced by North American and Douglas attack bombers, which have two engines and are bigger and much faster. The Navy's Grumman biplane fighters, those squat, deep-bellied things, are giving way to Grumman and Brewster monoplanes that can fly rings around them. The Army's B-18 bomber, the military version of the DC-3 that is standard on American airlines, is good for only about 225 m.p.h. and is being replaced by 290-m.p.h. Douglas B-26's and Martin B-23's. Furthermore, these planes are being tested under actual wartime conditions for the first time, and many little interesting facts about their construction and performance are being revealed. It's one thing to try a plane in a wind tunnel and in carefully-prepared test flights, and it's an altogether different thing to send it up into the overcast against determined enemy fighters.

The reassuring part of the whole business has been the splendid performance of the American planes. The Curtiss P-36, the Army's standard pursuit plane, proved extremely successful against the famed Messerschmitt 109. Hundreds of them earned the undying respect of the French pilots who flew them. The only trouble was, of course, that more and more Messerschmitts continued to come on, faster than the French could bring 'em down.

* * *

For Cut-Ups

"Design And Figure Carving," by E. J. Tangerman, published by Whittlesey House, opens new fields to the woodworker. Although the book stresses the artistic side of carving, it also goes into considerable detail concerning the tools used in the various types of work. Drawings and photographs illustrate all types of work discussed. Resourceful home-workshop furniture makers should find numerous hints in this book, as many of the designs might be imitated readily with the aid of power tools. Comprehensive descriptions of the ornamentation of "period" furniture obviously makes the book useful to the amateur antique collector by providing a definite means of classification.

* * *

Our Addresses

Some readers are confused by the variety of addresses appearing on page 4 of each issue of MI. To straighten 'em out:

Send contributions and letters regarding editorial matter to "Editor, MECHANIX ILLUSTRATED, 1501 Broadway, New York, N. Y." Send orders for blueprints, copies of our various annual and back copies of MI to "Circulation Department, Fawcett Publications, Inc., Greenwich, Conn." Thank you!

Robert Hertzberg, Editor.

LAFAYETTE'S
GREATEST RADIO CATALOG

Never before a catalog like this. Tops every effort we've ever seen at catalog completeness, wide selection and value-giving. Here, literally, is everything in radio arranged for quick, easy reference. Take a tip—this book's a smash-hit—reserve your copy at once!

LOOK WHAT'S IN IT!

196 PAGES OF VALUES

Radios—over sixty brilliant models—with every last-minute feature, beautiful new styling and power galore. Includes portables, table models, radio-phonographs, farm and auto receivers. Build-it-Yourself Radio Kits, complete nationally advertised parts, tubes, equipment and handy tools. Amateur radio and sound amplifying equipment—196 pages, and every page talks big value!

SEE HOW MUCH YOU SAVE!

Prices in this catalog are all bed-rock low. You save on everything you buy. And deliveries to your door—no matter what the size of the order—is an added saving, in time as well as money. Here's a catalog you will certainly want.

HOW TO GET IT!

So great is the expected demand for this new, "last-word" edition of the greatest catalog in radio that we are asking you to reserve your copy in advance. All you need do is mail the coupon. A copy of Catalog No. 82 will be sent to you. Don't delay. Act now.

NEW YORK • CHICAGO • ATLANTA • BOSTON, MASS.
BRONX, N. Y. • JAMAICA, L. I. • NEWARK, N. J.

Lafayette Radio — 20th Year of Radio Leadership

RUSH COUPON NOW

LAFAYETTE RADIO — DEPT. 22J,
901 W. JACKSON BLVD., CHICAGO, ILL.
or 100 SIXTH AVENUE, NEW YORK, N. Y.

I don't want to miss this great catalog. Please reserve my FREE copy.

NAME .....

ADDRESS .....

CITY ..... STATE .....

PASTE COUPON ON PENNY POSTCARD

High School Raises Your Standards of { LIVING / TRAINING / INCOME

Many Finish in 2 Years

Finish High School at home, as FAST as time and ability permit. Equivalent to resident school work—prepares for college, pre-professional examinations, business, industry. Standard texts. Diploma. Credit for High School subjects already completed. Single subjects if desired. American School, Chicago, est. 1897. FREE Bulletin. Write TODAY!

American School, Dept. H-628, Drexel Ave. at 58th St., Chicago
Send free information as checked below. No obligation.

- HIGH SCHOOL COURSE
- Accounting and Auditing
- Architecture and Building
- Automotive Engineering
- Business Management
- Aviation
- Electrical Engineering
- Electric and Gas Refrigeration
- Air Conditioning
- Diesel Engineering
- Drafting and Design
- Liberal Arts
- Private Secretary
- Mechanical Engineering
- Radio and Television
- Home Economics Courses

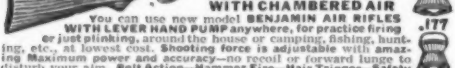
Name .....

Address .....

Promotion Begins at Home

NEW BENJAMIN AIR RIFLES WITH HAND PUMP

MADE IN U.S.A.



.22 .177 BB

HARD ACCURATE SHOOTING WITH CHAMBERED AIR

You can use new model **BENJAMIN AIR RIFLES WITH LEVER HAND PUMP** anywhere, for practice firing or just plinking, around the house or camping, fishing, hunting, etc., at lowest cost. **Shooting force is adjustable** with amazing **Maximum power and accuracy**—no recoil or forward lunge to disturb your aim. **Bolt Action—Hammer Fire—Hair Trigger—Safety Lock-Hand Pump.** Single Shot BB $7.50; Single Shot Cal. .177 or .22 with rifled barrel $8.50; BB 25 Shot $9.00. Also a complete line of **BENJAMIN GENUINE COMPRESSED AIR PISTOLS** from dealer or factory. **Write for full details and FREE TARGETS.**

BENJAMIN AIR RIFLE CO., 829 Marion St., St. Louis, Mo., U.S.A.

LAW STUDY AT HOME

Legally trained men win higher positions and bigger success in business and public life. Greater opportunities now than ever before. Big corporations are headed by men with legal training.

More Ability: More Prestige: More Money

We guide you step by step. You can train at home during spare time. Degree of LL. B. Successful graduates in every section of the U. S. We furnish all text material, including 14-volume Law Library. Low cost, easy terms. Get our valuable 48-page "Law Training for Leadership" and "Evidence" books FREE. Send for them NOW.

LaSalle Extension University, Dept. 9493-L, Chicago
A Correspondence Institution

MONEY for MEN ALL DATA **FREE**

THE PLASTEX Industry needs manufacturers on small scale and for big production of Lamp and Clock Stands, Art Goods and Novelties in Plastex and Marble imitation. Experience unnecessary. 15c material makes regular 10c store sellers. Rubber molds furnished for speed production. Small investment brings big returns. War causes great shortage of these goods. Ambitious men have chance for real prosperity. Our free booklet will interest and benefit you.

PLASTEX INDUSTRIES
Dept. 3. 1085 Washington Ave., New York, N. Y.

Popular Patents

A shockproof armored helmet whose crown moves by impact of a bullet or shrapnel is the object of a recent patent. The inventor points out that previous helmets having rigid crowns cause shock to the soldier when the helmet is struck by a bullet. In addition the rigidity of the helmet is said to have assisted the bullet in penetrating. However, all of these difficulties are overcome, the inventor states, by mounting the crown of the helmet on a series of springs. This arrangement permits the crown to move freely under the impact of the bullet, and returns the crown to normal position when the bullet has dropped.

* * *

Simplicity alone is not sufficient to invalidate a patent.

* * *

Changing your face may be a difficult task. However, how to replace the face of a doll is told in a patent recently issued. By means of spring clips various faces can be attached to the doll, to provide a crying child, a laughing child, or a serious child. Animal toys may be provided with various animal faces, according to this patent.

* * *

Only the actual inventor should file an application for a patent. A financial backer who has no part in making the actual invention should not file. Any patent is invalid if it has not been granted on an application filed by the real inventor.

* * *

A newly filed patent application will not ordinarily be examined out of its regular turn unless special circumstances exist, such as an increase of employment due to exploitation of the patent if it is granted.

[*Continued on page 20*]

BOOK BARGAINS *for* MEN AND BOYS!

These four handsome books, priced amazingly low at only 50 cents each, belong on the shelf of every man or boy who likes to work with his hands. They are printed in rotogravure, expertly written, and lavishly illustrated. All books sent postpaid. Order by coupon.

HOW TO BUILD IT—This all-new edition is packed with fascinating and useful home workshop projects, suitable for beginners and experts alike. Contains articles on woodworking and metal projects, radio, hammered copper ware, glass blowing, lamps, plaques, tennis table, sidewalk runabout, etc. Complete, detailed, simple specifications throughout. Fully illustrated, 144 pages.

MODEL BUILDERS' HANDBOOK—Build your own model planes, boats, auto racers! *Model Builders' Handbook* contains complete, detailed plans for the construction of twenty-seven superb working models. Using these plans, you can easily build gas-powered planes; Slipstream Susy, super-streamlined auto racer; Yumping Yiminy, fast 27" powered speedboat, and others. Also special features on care and conditioning of model engines.

HANDY MAN'S HOME MANUAL—This book will repay its cost many times over by telling you how to make countless repairs and improvements around the house without calling in professional help. Full of easy how-to-make, how-to-repair, and how-to-improve kinks. Simple plans for building useful equipment such as gates, garden furniture, kitchen cabinets, etc. Hundreds of other valuable tips for the handy householder. Fully illustrated.

GOOD PHOTOGRAPHY NO. 4—Full of simple, practical articles on filters, diffusions, still-lifes, nude photography, color photography, etc. Plus more than 80 pages of outstanding photographs, including a large colored portrait of one of the most spectacular photos of the year. No matter what branch of photography you are interested in, this book will help you.

50¢

--- CUT OUT AND MAIL TODAY! ---

FAWCETT PUBLICATIONS, INC. MI-9
Greenwich, Conn.

Enclosed find money order, check or stamps (no coins). Please send me, postpaid, the book (s) I have checked below, at 50 cents each

☐ HANDY MAN'S HOME MANUAL ☐ MODEL BUILDERS' HANDBOOK
☐ GOOD PHOTOGRAPHY No. 4 ☐ HOW TO BUILD IT

Name .....

Address .....

City..... State.....

(Note: If you do not wish to cut this page, you may order by letter. Be sure to enclose full address and remittance.)

For More Pay Train To Enter

DRAFTING INDUSTRIAL DESIGN

Get into a Better Pay field with a big future by learning DRAFTING and DESIGNING quickly from an Engineer and Industrial Designer. Private, individual training at your home. Drawing tools and table furnished without extra cost. Learn to draw and design new products, or to improve, re-style, streamline and modernize old products for more "eye appeal" and selling power.

Drafting is a very big field, but **drafting with industrial designing** is twice as big. Factories must **continuously** bring out new models, new products, and improved designs. You can learn both subjects right in your own home, in your spare time. You can be trained for better pay as I have trained many hundred successful students. I'll train you **thoroughly by applied instruction** on actual work until you are holding a good paying position. Write for complete details on "Drafting and Industrial Designing."

ENGINEER DOBE

LIBERTYVILLE, ILLINOIS Div. 4746

AVIATION APPRENTICES

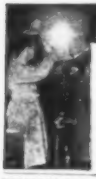
AIRMINDED YOUNG MEN INTERESTED IN TRAINING FOR ENTERING THE WELL PAID FIELD OF AVIATION AS APPRENTICES—Write immediately, enclosing stamp.

MECHANIX UNIVERSAL AVIATION SERVICE COMPANY
WAYNE COUNTY AIRPORT Box 857 Dept. A Detroit, Mich.

GET INTO THE BAKING BUSINESS!

National Baking Institute announces a new home study course in commercial baking. Baking now America's fifth industry in wages. Nearly a depression-proof business. Good field for ambitious men. Common school education sufficient. **Send for free booklet** "Opportunities in Commercial Baking" and requirements.

National Baking Institute
3601 Michigan Ave. Dept. 2056, Chicago, U. S. A.



LEARN WELDING

Both **Electric Arc** and **Acetylene** by practical Shop-Plan method in a few short weeks. No text-books. You learn by doing. Finest equipment. Low tuition. Pay-After-Graduation-Plan. Also, courses in Auto Mechanics, Collision Work, Metal Finishing, etc. Illustrated literature free. Write today.

MICHIGAN TRADE SCHOOL
3736 Woodward, Detroit, Mich.

Write for **FREE FOLDER**

HOBBYISTS!

Let Hobby-Specialists help you with your collections. Look through their offerings in the MONEYMAKERS & MONEYSAVERS Section (pages 27-32).

Earn Cash at Home!

We paid M. M. $1174 for exceptional "cellar crop" SNOW-KING mushrooms! Big free picture book tells if your cellar, shed, barn, suitable. We furnish materials, buy all you raise, guarantee starting crop. Write today for "Guaranteed Success Plan" backed by company established 1908—Twenty-five coast to coast branches.

UNITED MUSHROOM CO.
3848 Lincoln Ave. Dept. 483, Chicago

Popular Patents

[*Continued from page* 18]

Camera fans will welcome a new rest for insuring clear and sharp pictures. The camera is provided with arms on which are fastened rubber buttons. The buttons form a three-point support with relation to the head of the user. The invention may be adapted to still or movie cameras.

* * *

Completing 150 years of service, the Patent Office, in April, issued patent 2,196,966.

* * *

If a newly patented hair-catching trough is widely adopted, sweeping hair from barber-shop floors may become unnecessary. The new mantle is worn around the neck of the customer, leaving the arms free, as for smoking. The trough opens at the neck to provide a close fit. A catch-all at the front of the mantle collects all falling hair. The device is useful for hair cutting, neck shaving, hair singeing and dry shampooing.

* * *

The patent office is housed in the Commerce Building, which is reputed to be the largest office building in the world.

* * *

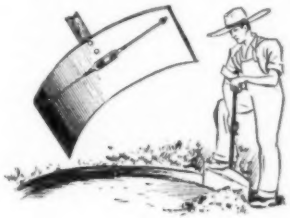
Sleeping at the wheel is prevented by the use of a newly patented vaporizer which attaches to the steering wheel of an automobile. By means of this device, aromatic spirits of ammonia is blown into the face of a driver when he feels drowsy. By inhaling the gas, the driver quickly overcomes his sleepiness. The blower operates automatically when drowsiness causes the driver to relax his grip on the wheel.

[*Continued on page* 21]

Popular Patents

[*Continued from page 20*]

Flower bed edging is made easy if one uses an adaptable curved tool recently patented. Circular, oval, or any other curved beds can be obtained by adjusting the degree of curvature of a normally flat blade by means of a trunbuckle device. By adjustment of the turnbuckle, the sides of the blade can be moved to any desired degree of curvature.



* * *

Add to your list of simple inventions that netted a fortune the turn-back collar button.

* * *

Deep water should be no cause for alarm if you are wearing a patended swimming suit having a number of air pockets. The suit has inflatable pockets of rubber which may be blown up by the mouth of the swimmer. A valve located at the front of the suit supplies air for all the pockets.

* * *

Scooters have always enjoyed deserved popularity. Now a new style of scooter is available according to a new patent. While the usual scooter has front wheels which can be turned to steer the scooter, the new invention fixes both front and rear wheels so they cannot be turned. Steering is accomplished by lifting the forward part of the scooter by means of a rope. This relieves the front wheel of ground grip, and by swinging the chassis horizontally, during the time of lift, the scooter can be turned in either direction as desired.

[*Continued on page 22*]

MACHINE SHOP MEN

Learn to set up and run ANY kind of machine; MAKE MORE MONEY NOW by learning quickly HOW TO DO THINGS which usually take years of study and practice. The demand for SKILLED men is ALREADY ahead of the supply, then what WILL IT BE a month or two from now?

Needed *NOW!*

Bigger Pay Don't miss this chance to qualify for promotion, don't miss this Big Opportunity which is yours almost for the asking. Eight Big Books chockful of important mechanical facts told simply and clearly. Over 3000 pages, nearly 3000 illustrations cover every subject fully, including Tool Making, Pattern Making, Foundry Work, Mechanical Drawing, Forging, Machine Shop Practice and Management, and hundreds of other subjects.

8 Big Books (1940 Edition) Sent *FREE*

to you for examination. Decide in your own home or place of business whether or not you want to keep them, check up on any facts you want to. Note their great MONEY MAKING value, then, if you want them, pay on the easiest kind of payments. Send NOW and we will include a year's consulting membership in the American Technical Society without extra charge—and also a **BIG BINDER** of nearly 800 pages with 267 original shop tickets with 1200 illustrations. These show, step by step, how to set up and run almost any kind of job and are in **ADDITION** to the 8 books.
American Technical Society, Publishers—Home Study Courses.

American Technical Society, Dept. S6320, Drexel at 58th St., Chicago.
You may send me the 8 big NEW books and binder of shop tickets for free examination. I will pay the few cents delivery charges only, unless I decide to keep them in which case I will send $2.00 in ten days and $3.00 per month until the total price of only $34.80 is paid. If I return them in 10 days I will owe you nothing. Because I send now you agree to give me a membership in the American Technical Society entitling me to consulting privileges with any of your experts for one year.

Name .....

Address .....

Please attach a letter stating age, occupation, employer's name and address and that of at least one business man as reference.

U. S. Government Jobs

START $1260 TO $2100 A YEAR

MEN—WOMEN

Many appointments each year

32 Page Civil Service Book FREE

Mail Coupon Today—SURE

COUPON

FRANKLIN INSTITUTE
Dept. G 255
Rochester, New York

Gentlemen: Rush to me, FREE of charge, list of U. S. Government big pay positions. Send me FREE 32-page book describing salaries, hours, work, vacation, and giving full particulars on how to qualify for examinations.

Name .....

Address .....

What is keeping *you* out of Aviation? These and hundreds more Aero ITI-trained men stepped directly into aircraft work upon graduation—and found Aviation the fascinating, opportunity-laden field they had looked forward to. Aero ITI training won them a sound start and a good job. It prepared them with the broad, thorough, intensely practical knowledge and abilities to advance along with Aviation's own swift and lasting development. Find out all about this *proven* Aero ITI way to an Aviation career.

EXECUTIVE BOARD
JOHN K. NORTHROP, President, Northrop Aircraft, Inc.
ROBERT E. GROSS, President, Lockheed Aircraft Corporation
C. A. VAN DUSEN, Vice-Pres., Consolidated Aircraft Corporation

AERO INDUSTRIES TECHNICAL INSTITUTE
9265 W. SAN FERNANDO ROAD, LOS ANGELES, CALIFORNIA
Five Courses In AIRCRAFT MECHANICS and AERONAUTICAL ENGINEERING, including U. S. Civil Aeronautics Authority Approved 12 Months Aircraft Mechanics Training

LES — "A Correspondence Education"

Correspondence Courses In RADIO and ELECTRICAL ENGINEERING

SPECIAL Only $25

ELECTRICAL ENGINEERING Get good grasp of wide electrical field. Prepare yourself, at Low Cost, for secure future. Modern course. So simplified anyone can understand quickly.

RADIO ENGINEERING Extra fine course in radio, public address, photo-electric work. Trains you to be super-service man, real vacuum tube technician. Experimental kits furnished. Diploma given on completion. Tuition, ONLY $25, either course. Deferred payment plan available.

FREE! Send name quick for free copies of school catalogs, student magazines, complete details. SEND NOW.
LINCOLN ENGINEERING SCHOOL, BOX 931-M21, Lincoln, Nebr.

Over 20,000,000 Bibles SOLD LAST YEAR!

Here's an Amazing BIBLE BARGAIN

Sells for $1.95 — You Make $1.00 Average

World's fastest-selling book. Deluxe Edition now only $1.95. Experts say it's a $5.00 value. Average profit $1.00. Churches, schools, institutions buy large quantities. Every home a prospect. Miracle value makes fast, profitable sales. Rush name and address TODAY.

WESTCRAFT, DEPT. 113, RACINE, WISCONSIN

INVENTORS!

Market your inventions with the aid of the inventors' services advertised on these pages, 6-7-12-13, also in our MONEYMAKERS & MONEYSAVERS (pages 27-32).

Learn Photography at HOME

Splendid opportunities. Prepare quickly in spare time. Easy method. No previous experience necessary, common school education sufficient. Many earn while learning. Send for free booklet "Opportunities in Modern Photography" particulars and requirements.
AMERICAN SCHOOL OF PHOTOGRAPHY
3601 Michigan Avenue Dept. 2056 Chicago, Illinois

Popular Patents

[*Continued from page 21*]

Abraham Lincoln is the only president to obtain a patent. He received patent No. 6,469 on May 22, 1849, for an improvement in steamboat navigation.

* * *

More than 100 patents a day are issued by the Patent Office.

* * *

Other recent patents include an automobile bumper which automatically releases itself when it locks with another bumper . . . a zipper attaching improvement for fastening collars and cuffs to shirts and dresses . . . a tape containing both seed and fertilizer. The tape is planted and dissolves in the ground leaving the seed and fertilizer . . . an auto polisher which operates by air from a spare tire . . . and a battery lit bait for attracting fish.

—*By Morton Leese*

Patents Identified			
Helmet	2,197,174	Suit	2,197,228
Toy doll	2,199,049	Scooter	2,198,667
Camera	2,199,662	Zipper	2,199,462
Trough	2,199,334	Tape	2,197,594
Awakener	2,199,060	Polisher	2,200,194
Edger	2,199,072	Bait	2,197,372
		Bumper	2,198,657

A junior student of Syracuse University, Syracuse, N. Y., is working his way through college by trapping fur-bearing animals not far from the city.

BIG MONEY STEADILY FOR YOU!
INCREASE YOUR INCOME
Be our representative in your locality for Dove Work Garments. No experience necessary. Pleasant, simple work. Every business prospect. Advertising embroidered on garments great sales feature. Increase your income every week. We supply everything needed to start at once, including FREE OUTFIT. Write immediately. BEN DOVE GARMENT CO., 601 S. Fourth St., Dept. 826, Kankakee, Ill.

12 MILLION UNEMPLOYED

men and women is a wasteful and unnecessary condition. There wouldn't be that many if they knew that 250 large and reliable firms have good openings for ambitious workers. I have the names, addresses, and offers of these companies, which I will gladly mail to you upon receipt of 10c in coin or stamps. (I make no money on your dime, which I have already spent to buy this space.
R. D. Bernard, 22 E. 12th St., Cincinnati, Ohio.

FOLLOW THIS MAN
Secret Service Operator No. 38 is on the job! Running down dangerous Counterfeit Gang. Foiltale finger prints in murdered girl's room.
Free *The Confidential Report Operator No. 38 made to his chief. Write for it.*
Earn a Regular Monthly Salary
YOU can become a Finger Print Expert at home, in your spare time, at small cost. Write for confidential full report and details. Literature will be sent only to persons stating their age.
INSTITUTE OF APPLIED SCIENCE
1920 Sunnyside Ave.
Dept. 2356 Chicago, Ill.

SENSATIONAL BURNER IMPROVEMENT

-MAKES OIL BURN JUST LIKE CITY GAS

SAFE — No Explosive Oils No Gasoline

Produces HOT, CLEAN (White-Heat) FLAME

AT LESS THAN 1/2 THE COST

NOT LIKE any oil burner you've ever seen. No noisy roar—no smoke—no soot—no clogged jets. Amazing improvement in generator design (precision built) makes cheap oil burn as clean and hot as city gas, at one-third to one-half the cost. Slips into any coal or wood range, stove or heater—special models for griddles, water coils, urns, etc. —attached in few minutes—operated efficiently by anyone without experience or mechanical ability.

WIDE OPEN for DISTRIBUTORS and AGENTS

A sensational small town and farm seller—a surprising city demand in plants and factories who substitute cheap oil for costly city gas. Models for all purposes. Easy sales to homes on time-pay plan. Rated business concerns handled on open account to enable salesmen to handle big deals without investment. Absolute customer satisfaction brings amazing repeat and referred sales.

FREE—Don't lose a minute. All facts are FREE. Rush your name quickest way for book showing and describing all models Liberty Burners. Big profits for right men either as agents or distributors with sub-agents. No money. Just your name and address, for breath taking facts on biggest opportunity of the day.

LIBERTY BURNER CO., Dept. A629, 620 N. Michigan, Chicago, Ill.

ALL THESE PROSPECTS

Will heat stoves, ranges, urns, steam tables, grills, vulcanizers, water coils, ovens, griddles, pressing machines, tanks, etc.

NEW BRUSH PLATING OUTFIT For AUTO PARTS

Connects to a battery with no tanks necessary. Plates on iron, steel, brass, copper, etc. Almost as simple as painting. Hundreds of car owners waiting for this low-cost plating. Improves appearance and value of the car. Your opportunity to make good income plating auto parts, bathroom fixtures, reflectors, mirrors, etc.

FREE PROOF

Write quick—big season here. Get FREE PROOF and particulars that put you in a paying business of your own.

GUNMETAL COMPANY

AVENUE P, DECATUR, ILL.

Be a RADIO SERVICE EXPERT LEARN AT HOME IN SPARE TIME

Clear, simple, fascinating lessons—practical work with experimental kits—make training easy and fast. Up to date R.T.A. methods, under personal guidance of prominent engineer and educator, highly endorsed by leaders in radio industry. Spare-time profits soon pay for training.

START NOW—have your own business or fit yourself for well paid work with radio dealers, in factories, police, marine or television fields. DON'T DELAY! Send AT ONCE for complete information and Big Opportunity **BOOK FREE!**

RADIO TRAINING ASSOCIATION OF AMERICA

1559 Devon Ave., Dept. MI-90, Chicago, Ill.

Home Study

EARN A DEGREE AT HOME

From A Chartered Institution of Higher Learning

Employers Now Demand College Graduates With Degree

88 Degree Courses in Art; Science; Philosophy; Education; Psychology, Public Health, Medical Jurisprudence; Sociology; Physics, Chemistry; Pol. Science; Theology; Law; Business Training; Accounting; Statistics; Agriculture, Electrical, Mechanical, Civil, Structural, Diesel, Architectural, Mining, Drafting, Automotive, Aeronautical, Radio, Refrigeration, Highway, Marine, Air Conditioning, Geology, Petroleum, Industrial Chemical Engineering. Founded 1909.

McKinley-Roosevelt, 4750-C Sheridan Road, Chicago

---

628 p. CATALOG—9000 NOVELTIES

Rush 3¢ for mammoth catalog of unusual novelties. 628 pages. 4000 illustrations. 9000 novelties. Roto section. 6-color cover. Radios, candid cameras, optical goods, novelty jewelry, unusual books and seeds, airplane and hobby kits, live animals, rifles and guns, fireworks, make-up supplies, joke goods, magic, outdoor and sport items, labor-saving devices, musical instruments, puzzles, wigs, auto and bike accessories, live ants, watches, knives, rubber stamps, smoker's novelties, European novelties, articles from the Orient and Far East, occult and fortune telling articles, money making outfits, muscle developers, religious articles, symbol jewelry, archery, fencing, stamps for collectors, projectors and films, etc., etc. (Cloth Bound Edition, 15¢). *FREE! 96 page supplementary catalog of 1000 novelties.*

JOHNSON SMITH & CO., Dept. 523-H, Detroit, Mich.

Earn $150 to $300 PROFIT monthly with new Arc Welding

30 DAYS TRIAL at Hobart's risk and easy "Pays for itself" Terms

"BUILD YOUR OWN" Arc Welder

Couple your own engine to this unit on a used auto chassis and you have the money-making advantages of a portable welder at a saving of $300 to $500.

Now you can start a profitable welding business and easily clear $150 to $300 every month. With present low prices arc welding is now made available to you at little cost, and with this equipment it's easy to get the profitable big pay jobs. Hobart Arc Welders are simple to operate. Faster welding with that extra capacity and guaranteed to bring quality welding business.

LET YOUR WELDER PAY FOR ITSELF

You can own your welder with practically no expense to you. The extra profit on a single job is usually more than enough to take care of the small monthly payments. You can even rent a new Hobart and later purchase it without loss.

HOBART BROS., BOX SM-940, TROY, OHIO

Send me information without obligation on ☐ Electric Drive Welder ☐ Gas Drive Welder ☐ Build Your Own Welder ☐ 30 Days Trial. Easy Terms. Send me free books I've checked.

Name_____

Address_____

FREE! BOOKS on ARC WELDING Check Coupon

☐ How to "Build-Your-Own"

☐ New Profits in Arc Welding

☐ New Arc Welding Cat

MAKE BIG MONEY at HOME!
NEW INVENTION
Electroplates by Brush

FREE
SAMPLE and BOOKLET
EXPLAINS ALL

New, patented invention makes possible big earnings AT HOME. Replate auto-parts—worn articles in homes, stores, hotels, restaurants, etc., with durable, sparkling, new coat of metal—with stroke of brush. Easy, simple, quick. Genuine Gold, Silver, Nickel, Cadmium, etc. Everything furnished. Outfit complete, ready for use. No shop required. Clear from $2 to $5 an hour in lifetime business. Small investment starts you in business. Steady repeat. Machine can pay for itself in week. Send TODAY for FREE SAMPLE and illustrated BOOKLET how you can have a life income from a business of YOUR OWN built upon satisfied customers. Act at once!
WARNER ELECTRIC COMPANY
Dept. 12-Z, 360 N. Michigan Ave., Chicago, Ill.

Complete **RADIO COURSE** **$1.95** POSTPAID

Amazing bargain. Authorized exact reprint of Radio Technical Institute regular $39.00 course, offered for $1.95, postpaid. New 1939 edition with Television. Learn quickly to be a radio expert. Limited quantity. Money back guaranteed.
Send only $1.98, full price for complete course.
Supreme Publications, Agents, 3727 W. 13th St., Chicago, Ill.

CARTOON YOUR WAY TO SUCCESS!

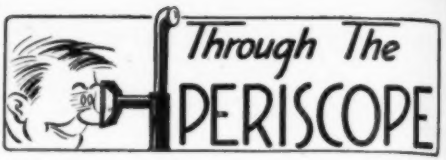
DON'T COPY - LEARN TO ORIGINATE!
RAYE BURNS will teach you HOW to CREATE ORIGINAL CARTOONS, at home, you may SELL! Cost is unusually low. Write for FREE Sample lesson plates, drawing test, and addresses of successfully trained students. No obligation.
RAYE BURNS SCHOOL, Dept. F, Box 2194, Cleveland, Ohio

Learn MECHANICAL DENTISTRY
A profession offering unlimited opportunities. Most modern and complete course embracing every branch from Plate to Porcelain Work, which prepares you to work for Dentists or start your own business. Individual instruction—practical training in day or night school. No books—no classes. Catalog upon request.
McCARRIE SCHOOL OF MECHANICAL DENTISTRY
207 N. Broad St. Dept. 914, Philadelphia, Pa.

LET ME PROVE I CAN MAKE YOU A NEW MAN

I changed myself from a 97-lb. weakling to winner of title, "World's Most Perfectly Developed Man." Let me prove that my secret of Dynamic Tension can give you powerful muscle, smashing strength, a handsome build? All I ask is a 7 DAY TRIAL. Write for my 48-page FREE BOOK.
CHARLES ATLAS, Dept. 69, 115 East 23rd Street, New York City.

SEND FOR MY FREE BOOK



Rabbits, together with opossums, are the real bluebloods of the animal kingdom, according to Dr. William B. Scott, professor emeritus of geology at Princeton University. These animals are the most ancient of the living known mammals on our continent, dating back to Eocene times, some 30 to 40 million years ago.

Well, it gives us an explanation of why rabbits are always wrinkling their noses—they're just disgusted with having to live in a world of new-fangled upstarts!

* * *

Most of the world's "new" military and naval innovations, when studied closely, are found to be pretty old stuff. No exception are the proposed new battleships with "turtleback topsides" as protection against air bombs. Around 1900, certain French and Russian warships had what were then called "tumble-home topsides," reported to be ill-ventilated and quite uncomfortable for their crews.

* * *

Incidental intelligence: It isn't the shiny silvery surface of the mirror which you think you see—but the electrons in it that do the reflecting of light. Similarly, electrons compose the ionosphere, 50 to 250 miles above our heads, which reflects radio waves back to earth, thus making it possible for radio communications to be heard over long distances.

* * *

Electricity is the anesthetic used to quiet fish in

[*Continued on page 25*]

Through The Periscope

[*Continued from page 24*]

order that they may be counted, weighed, marked or subjected to whatever treatment—in the interest of better fish—that fishery experts wish to give them. Ordinary 110-volt current from the nearest light socket is used in this stupor-inducing treatment, picturesquely referred to in the official Department of Interior announcement as a "fishy Mickey Finn." Such a dose of current for five to seven seconds keeps a 6-inch brook trout asleep for about two minutes. Upon recovery, the fish seem none the worse for the treatment.

A bit shocked, but otherwise healthy.

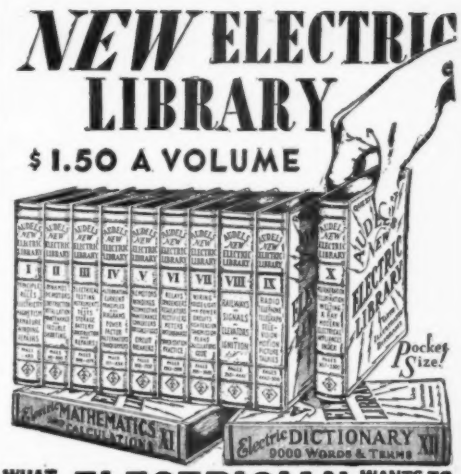
* * *

The newest candy is a by-product of cheese developed by B. H. Webb and C. F. Hufnagel of the U. S. Department of Agriculture's Bureau of Dairy Industry. Made from whey, a waste product in cheddar and Swiss cheese manufacture, the new candy is not cooked, but is dried hard and crisp. Sweet pasteurized whey and sugar are evaporated together under vacuum to a thick, smooth consistency; then air is whipped into it until light and fluffy. Chopped nuts or cooked cereal is added and the mixture is rolled out into a thin layer and dried, then cut up and dipped into chocolate. And what do they call this new product?

That's right—"Wheyfers!"

[*Continued on page 32*]

"Marry me, and I'll make you the happiest girl in forty-eight states!"



WHAT EVERY ELECTRICIAN WANTS TO KNOW!

Is easily found in AUDEL'S NEW ELECTRIC LIBRARY. Electricity made simple as ABC. Up-to-date, trade dope for the expert and ALL electrical workers. Questions, answers, diagrams, calculations, underwriter's code; design, construction, operation and maintenance of modern electrical machines and appliances FULLY COVERED.

All available at small cost, easy terms. BOOK-A-MONTH service puts this NEW information in your hands for 6c a day. You can start your subscription with any volume. Write TODAY for electric Folder and FREE TRIAL offer.

THEO. AUDEL & CO., 49 W. 23rd St., New York City

Mail Vol. I, Electric Library on 7 days' free trial. If O. K. I will remit $1.50, otherwise I will return it. I also request you to mail one book each month on same terms. No obligation unless I am satisfied.

Name.....

Address.....

Occupation.....MM

BECOME AN EXPERT

ACCOUNTANT

Executive Accountants and C. P. A.'s earn $2,000 to $10,000 a year. Thousands of firms need them. About 20,000 Certified Public Accountants in the U. S. We train you thoroly at home in spare time for C. P. A. examinations or executive accounting positions. Previous experience unnecessary. Personal training under supervision of staff of C. P. A.'s, including members of the American Institute of Accountants. Write for free book, "Accountancy, the Profession That Pays."

LaSalle Extension University, Dept. 9483-H, Chicago

A Correspondence Institution

Learn Profitable Profession in 90 days at Home

Earnings of Men and Women in the fascinating profession of Swedish Massage run as high as $40 to $70 per week but many prefer to open their own offices. Large incomes from Doctors, hospitals, sanitariums and private patients come to those who qualify through our training. Reducing alone offers such rewards for specialists. Write for Anatomy Charts, and booklet —They're FREE.

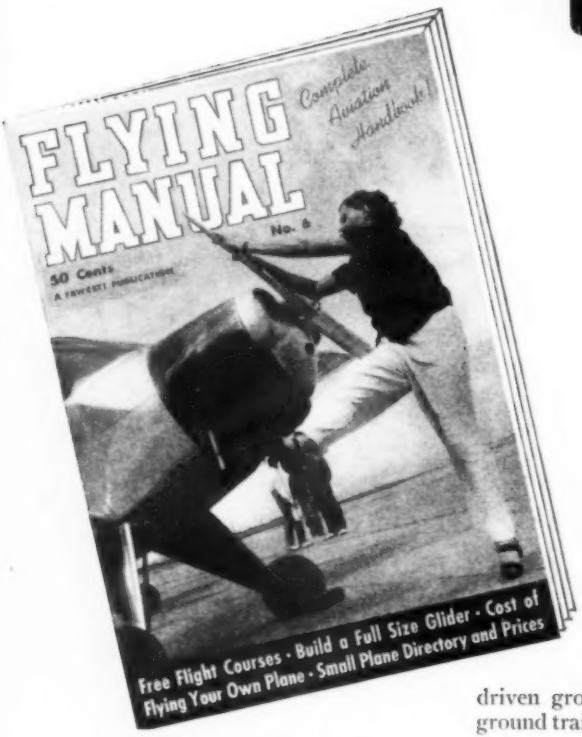
THE College of Swedish Massage
30 E. Adams St., Dept. 638, Chicago
(Successor to National College of Massage)

NOW a DYNAMIC HEAVY DUTY INDUSTRIAL WELDER for Only $19.95 RETAIL

WORKS Off 110-Volt Light Socket. This marvelous Dynamic Power Welder does the work of much higher priced types. It is easily portable. WELDS Cylinder Blocks, Bumpers, Fenders, Tanks, Farm Machinery, etc. Will also solder and braze on the lightest material. Works on iron, steel, tin, brass, copper and all other metals. Men without previous experience can make as much as $5.00 on a one hour repair job. In a year's time a Dynamic Welder COSTS YOU LESS THAN 6 CENTS A DAY

Free instructions—Open a welding shop now. AGENTS—Make big profits selling to garages, factories, janitors and machine shops. Write today for our 10-DAY TRIAL OFFER. DYNAMIC WELDER COMPANY, 2226-NC SILVERTON ROAD, CHICAGO, ILLINOIS

Build A Full Sized GLIDER!


FLYING MANUAL
Complete Aviation Handbook
No. 6
50 Cents
A FAWCETT PUBLICATION
Free Flight Courses · Build a Full Size Glider · Cost of Flying Your Own Plane · Small Plane Directory and Prices

YOU can build your own modern, streamlined glider from the plans and specifications in the big, new edition of the Fawcett FLYING MANUAL, now on sale. This 146-page book, crammed with flying facts and pictures, costs only 50 cents.

Everything you want to know about flying, gliding and related subjects is contained in FLYING MANUAL. Every article is written by outstanding experts, such as Major General H. H. Arnold, Chief of the U. S. Army Air Corps, and Richard Dupont, soaring ace.

For beginners, FLYING MANUAL contains plans and complete information for constructing of a propeller-driven ground trainer, a manually operated ground trainer, and adjustable control models.

FLYING MANUAL gives you the low-down on the exact cost of flying, and presents the "Light Plane Directory" with photographs and prices of popular light planes.

These are only a few of the highlights in FLYING MANUAL. There are many more outstanding features. Order your copy now!

PLANES, PRICES AND POCKETBOOKS

This valuable article explains the economy of private flying. Also:

Learn to Fly FREE—With the CAA
Learn to Fly FREE—With the Army
Learn to Fly FREE—With the Navy

FLYING MANUAL not only gives you valuable information on flying as a sport and as a career, but also outlines the employment opportunities in the mechanical end of aviation. In fact, whatever phase of aviation you are interested in, FLYING MANUAL will answer your questions. No one who is interested in planes can afford to be without it!

NOTE: If you do not wish to mutilate this page by cutting out the coupon, you may order by letter. Write name and address clearly. Enclose 50 cents in check, stamps, or money order.

CUT OUT AND MAIL TODAY!

MI-9

FAWCETT PUBLICATIONS, INC.
Greenwich, Conn.

Enclosed find 50 cents in money order, check, or stamps. Please send me, postpaid, a copy of the new FLYING MANUAL.

Name .....

Address .....

City ..... State .....

Flashlight Holder Leaves Hands Free

Leaving both hands free and directing the light where desired, this handy holder for the flashlight is useful for the mechanic and handyman. The beam of the light can be pointed in any direction, up, down, or to either side.

CASH or Royalty quickly and Inexpensively for your unpatented invention; a service that's different; literature free. Mason, 1035-A East Eleventh Street, Oakland, California.

UNDER U. S. patent laws, 68c procedure completely protects your unpatented invention for two years. Complete details, 50c. Philip Lehrman, 786 E. 182 St., N. Y. C.

SELL your own unpatented inventions. Plan $1.00. No further obligations. Earl Ritland, Lock Box 22, Ames, Iowa.

GET Your Own Patents. Legal blanks, complete instructions $1. Cudding Sons, Campbell, California.

CASH for practical ideas and inventions. Mr. Ball, FA-9441 Pleasant, Chicago.

ARTICLES, thesis revised, written. Library research. Box 2363, Cleveland, Ohio.

PATENTS

INVENTORS—Have you a sound, practical invention for sale, patented or unpatented? If so, write Chartered Institute of American Inventors, Dept. 5-A, Washington, D. C.

INVENTIONS Promoted. Patented or Unpatented. Write Adam Fisher Co., 582 Enright, St. Louis, Mo.

PATENT ATTORNEYS

VICTOR J. EVANS & Company, 518-K Victor Building, Washington, D. C.—one of World's Largest Firms of Registered Patent Attorneys, Established 1898—will send you free—68 pages of facts for inventors. Two plainly written books tell you how to apply for patent—give six basic methods of selling your invention. Fees reasonable; terms arranged. Delay may be costly; write today.

INVENTORS—Take first step to protect your Invention—without cost. Get free Record of Invention form and 48 page Book, "Patent Guide for the Inventor". Time Counts! Write today. CLARENCE A. O'BRIEN, Registered Patent Attorney, OJ3B Adams Building, Washington, D. C.

INVENTORS—Before disclosing your invention to anyone send for Form "Evidence of Conception"; "Schedule of Government and Attorneys' Fees" and instructions Sent free. Lancaster, Allwine & Rommel, 426 Bowen Building, Washington, D. C.

"INVENTOR'S Guidebook" containing 96 mechanical movements and advice about patenting, selling inventions, also "Record of Invention", Free. Frank A. Ledermann, Patent Attorney-Engineer, 154 Nassau Street, New York.

INVENTORS: Send for my free 72-page book. Conscientious, prompt personal service on all patent matters. Registered Patent Attorney, L. F. Randolph, Dept. 763, Washington, D. C.

PATENTS. Booklet free. Highest references. Best results. Reasonable fees. Watson E. Coleman, Victor Building, Washington, D. C.

INVENTIONS WANTED

INVENTIONS—Manufactured in any quantity at low cost by old-established reputable company. No branches anywhere. Stampings, metal specialties, dies, models, etc. Free estimates. Free Catalog. Crescent Tool Co., Dept. T-S, Cincinnati, Ohio.

SIMPLE, practical inventions wanted by manufacturers, patented or unpatented. For information write Chartered Institute of American Inventors, Dept. 5-C, Washington, D. C.

SMALL Inventions wanted by manufacturers. I'll help you sell your invention. Write for free circular. Stanley Hull, 7829-L Euclid Avenue, Cleveland, Ohio.

WANTED—Meritorious patented, unpatented inventions. Booklet, references, free. Invention Reporter, 4B-11236 South Fairfield, Chicago.

521 INVENTIONS described with selling plan 10c. Patentee System, FB-9441 Pleasant, Chicago, Ill.

INVENTIONS Promoted. Patented or Unpatented. Write Adam Fisher Co., 582 Enright, St. Louis, Mo.

INVENTION Finance Magazine, 80-H Wall Street, New York. For inventors. Free particulars.

MODEL ENGINES

ENGINE Catalogue Castings, supplies, 25c. Howardco, M-2417 North Ashland, Chicago.

HOME CRAFTSMEN

LAWN Ornaments . . . easy to make. 20 full size patterns, birds, animals, etc., 25c; Dutch Boy, Dutch Girl, Sprinkling Girl, Fox Terrier, Scotties, Bulldog, 15c each, any two 25c; Dutch Windmill, 36 inches high, 25c. Entire collection, 27 patterns, $1.00 postpaid. Wickman Co., Dept. 199, Dayton, Ohio.

PATTERN Catalog finely illustrating 250 plywood Novelties, Silhouettes, Lawn Ornaments, Decal Transfer Decorations. Also other lines. Wo-Met Shop, Ashburn, Georgia.

628 PAGE Catalog. 9000 Novelties, puzzles, tricks, hobbies, guns, novelty jewelry, radios, cameras, etc., 3c. Johnson Smith, Dept. 523-P, Detroit.

BARNYARD Sketches. 10 lifesize lawn figure designs 15c. Garden Woodcraft Studio, 2026 Broadway, San Diego, California.

20 NOVELTY patterns, 25c. 15 Lawn Ornament patterns, 20c. Wayne Gorman, Box 1272-M, Amarillo, Texas.

Public Address System in Single Unit

A much simplified method of amplifying a speaker's voice is presented in this new and compact device. Microphone, amplification unit, and loudspeaker are all housed in one case. To operate it, the cord is merely plugged into any convenient wall socket. An electric light illuminates the tilted reading table on the top of the case. A provision is made for additional speakers.

BLUEPRINTS & PLANS

628 PAGE Catalog. 9000 Novelties, puzzles, tricks, hobbies, guns, novelty jewelry, radios, cameras, etc., 3c. Johnson Smith, Dept., 523-N, Detroit.

BUILD-IT-YOURSELF

BUILD power Scooters, Midget Cars. We supply tires, wheels, motors. Lowest Prices. Send 10 for plans, etc. Bild-Ur-Own Devices, Dept. 9-D, 536 North Parkside, Chicago.

MOTOR Scooters, Midget cars! Easily built. Complete plans and literature on wheels, tires, motors, transmissions, clutches, etc., 10c. Honsaker, Masontown, Pa.

MIDGET, Motorscooter supplies. Plans, parts, building kits. Circulars free. Complete catalog, 10c. Shipps Midgets, Box 543-B, Zanesville, Ohio.

BUILD your own beautiful 10x20 garage. Blue prints, complete instructions $1.00. Clark, 218 East Lexington, Baltimore, Md.

BOATS, OUTBOARD MOTORS

MARINE Conversion Parts for all auto engines. Buy here and save. Conversion Parts Co., 279 Adams St., Boston, Mass.

KAYAKS, Outboards, Rowboats, Weldwood ready-cut kits. Catalog. Cre-Craft Boats, Dept. D, Millburn, New Jersey.

FORD and Zephyr marine conversions. 10c coin. Lehman Engineering Company, Dept. C, Newark, N. J.

SPORTING GOODS

GUNSMITHING, Restocking Guide (24 pages). Free. Invaluable for Amateur, Professional gunsmiths, Home Craftsmen, Shooters; Exclusive, complete information, illustrations, Walnut stocks, Blanks, Gunsmith Tools, Remodeling, Actions, Blueing, Checkering Tools. Limited Supply. Write America's Great Gun House. Stoeger Arms Corp., 507 Fifth Ave., New York, N. Y.

AVIATION

GET Into Aviation! Train now at this Lincoln Aeronautical Institute for responsible position as Aeronautical Engineer, Air Transport Pilot, Aviation Mechanic or Aircraft Sheet Metal Craftsman. Good jobs open! Big Money Paid! We assist Graduates in locating positions. Part time employment for board and room while in training. Write today for information. Lincoln Aeronautical Institute, (Inc.), Lincoln Airplane & Flying School Division, 4005 Aircraft Building, Lincoln, Nebraska.

$10.13 STARTS building your own lightplane. Three view blueprint, details, 25c. J. W. Peterson Aircraft Co., 1139 Veto, Grand Rapids, Mich.

AVIATION Apprentices—Airminded Young Men interested in training for entering Aviation as Apprentices see ad on page 20.

PROPELLERS—all types. World's largest propeller catalog 10c. Banks Propellers, Love Field, Dallas, Texas.

RADIO & TELEGRAPHY

RADIO Engineering, broadcasting, aviation and police radio, Servicing, Marine and Morse Telegraphy taught thoroughly. All expenses low. Catalog free. Dodge's Institute, King St., Valparaiso, Ind.

CARTOONING, SIGNPAINTING, DRAWING AIDS

LEARN to draw by simple illustrated method. Big earnings. Free information or send $1.00 for a copy. John Leon, 121 South Hill Street, Los Angeles, California.

LEARN Cartooning. With this snappy, interesting, practical illustrated method. 50c complete. Studios Of Cartooning, 1202 Carroll St., Brooklyn, N. Y.

AMATEUR Cartoonists. Earn cash at home, copying advertising cartoons. 3-N Service, Argyle, Wis.

TELESCOPES, MICROSCOPES

TELESCOPES, Microscopes, Binoculars; 1940 bargain catalog free. Brownscope Company, 5 West 27th Street, New York.

FREE instructions build powerful telescope. Small cost. Jamer, Manorville, N. Y.

SPECTROSCOPES

SPECTROSCOPE quickest way to analyze chemicals, ores $2.50. Cudding Sons, Campbell, California.

SCIENTIFIC EQUIPMENT

STROBOSCOPE. Stops motion. Manufactures, laboratories, schools, shops. Free literature. E. A. Schlueter, 3382 Sixty-second Ave., Oakland, Calif.

TREES, SHRUBS, PLANTS

FIFTEEN different cactus plants $1. Easily grown anywhere. Eulalia Turners, Azusa, Calif.

HORSE TRAINING

"HOW To Break and Train Horses"—A book every farmer and horseman should have. It is free; no obligation. Simply address Beery School of Horsemanship, Dept. 1159, Pleasant Hill, Ohio.

DOGS FOR SALE

GREAT Danes Dependable Guards, perfect companions. Safe with children. Shipped on approval. Monthly payments. Kalmar Daneries, Stone Mountain, Georgia.

PERSONAL

WIN Prize Money: Booklet—"Successful Contesting"—Shows how. 10c postpaid. Bulletin listing $100,000.00 prizes included. World Publishers, 4515-K Cottage Grove, Chicago.

SHAVING ACCESSORIES

SPECIAL—100 double edge blades—big tube shaving cream—styptic—$1.00. Same deal with single edge blades—$1.50. Laga Sales, 440 Busti Ave., Buffalo, N. Y.

WATCHMAKING

WATCHMAKERS' Materials—Tools—Watches—Jewelry. Bought, sold, exchanged. Best prices for Old Gold, Diamonds. Ben Segal Company, 59 East Madison, Chicago.

MISCELLANEOUS

CASH for used Microscopes, Binoculars, Cameras, Drawing Sets, Slide Rules, Tools, Optical, Mechanical, Scientific Instruments, Silverware, or what have you. Satisfaction guaranteed. Gordon Co., 162 Madison, Chicago.

TREASURE Finder locates hidden money, lost treasure, minerals, pipes, etc. Build yourself. Instructions 25c. Craft Shop, 800-182 North Clark, Chicago.

RECEIVE gigantic mails, magazines, samples. Your name in numerous mailing lists 10c. Carol Howard, 396 Broadway, New York.

BURIED TREASURE, Minerals, free booklet, photographs. Fisher, Palmer Bldg., Hollywood.

Through The Periscope

[*Continued from page 25*]

A few issues back we told you about the rats at Princeton who refused to gamble, even when tempted by high stakes (hamburger); on top of this comes a bulletin from Johns Hopkins, in Baltimore, which tells us that rats, though offered ample opportunity, refuse to become drunkards despite much tempting with the finest alcoholic potions the Johns Hopkins scientists can whip up. If this glorification of the long-tailed rodents continues, the next thing we know, somebody will be appointing a rat to a high government post.

An appointment that would have to be Ratified!

* * *

Silk has been considered an essential material for war because it is used in parachutes and powder bags. It is on the Army-Navy Munitions Board list of seventeen "strategic materials." Thanks to nylon, the synthetic fiber of coal, air and water, developed by the American chemical industry, it can probably be removed from the list in the near future. Since most of the silk we use comes from Japan, this has significance. Just as nylon can encase feminine legs in satisfactory stockings, so it can also make satisfactory parachutes. It is said to be stronger than silk and less likely to mildew, and it is understood that the nation's air forces may switch over to nylon even before there is a silk shortage.

* * *

You may never see a dream—walking. But Dr. William A. Shaw has measured an imagination—lifting. In the *Archives of Psychology*, he tells of tapping with electric oscillograph and amplifier, electric potentials in the arm (which accompany muscular activity) during the real and imagined lifting of weights. Not only is there muscular activity in your arm when you imagine lifting a weight, but the amount of activity keeps pace with the vividness of your imagination. And the lifting of a heavy weight, in your imagination, is accompanied by more activity than is the imaginary lifting of a lighter weight.

* * *

Most persons, when an earthquake is once over, have no desire to repeat it, but the seismologists, who study such tremors scientifically, often want a return performance, so as to study the movements that took place. This, in effect, can be done with the new earthquake developed by Prof.

[*Continued on page 33*]

Through The Periscope

[*Continued from page 32*]

Arthur C. Ruge, of the Massachusetts Institute of Technology.

In many places, especially California, where earthquakes are likely to occur, "strong motion" earthquake recorders have been placed in strategic locations. The ordinary seismographs, which respond to tremors thousands of miles away, are so delicate that they cannot record the effects of a local quake. The strong motion instrument lies dormant until one happens in its vicinity, then it goes into action. Dr. Ruge now has available for study such records of about 40 earthquakes, including the disastrous one at Long Beach, California, in 1933, which killed 120 persons and caused damage to the extent of $50,000,000.

With the earthquake analyzer, the wavy lines in the record are scanned by an electric eye, and are transformed into a series of electric impulses. These are fed into a galvanometer, which has a swinging mirror, adjusted to vibrate with the same characteristics as any desired building or other structure. Thus, the swaying of such a building may be measured by recording, on a moving strip of photographic paper, a spot of light reflected by the mirror.

The characteristics of the swinging mirror are changed with another photo cell, or "electric eye," and can be adjusted by turning the control dials.

Professor Ruge expresses the opinion that the device will find other applications, such as analyzing rainfall or sunspot records, or for solving difficult vibrational problems of the mechanical engineer.—*Cliff Taylor.*

"This makes the second time our laundry's been mixed!"

AUTO BOOKS SENT FREE

on approval. Just mail the coupon and we'll send you a set of these remarkable auto books. Whether you are a mechanic or helper, expert or apprentice, auto owner or driver, if you're interested in knowing all about automobile mechanics, take advantage of this FREE EXAMINATION OFFER.

CAN YOU FIX IT?

These wonder books tell step by step HOW to take out "play" in differential—to kill the shimmy in steering—to set TIMING—how to put your finger on engine trouble and the expert way to FIX it.

6 BIG VOLUMES

2500 pages, 2000 illustrations, wiring diagrams, etc., including Marine Engines, Aviation Motors, Diesel engines, etc. De Luxe edition, gold-stamped flexible binding.

GET A BETTER JOB

A better job—in the gigantic auto industry. BIGGER PAY—a chance to go into business for yourself and get a share of the profits, are waiting for any man who even half tries to improve himself. Learn auto engineering with these wonder books a new way—a quick reference method. Simply use the JIFFY INDEX to look up the answer to any auto problem. Built by eleven of America's great automobile engineers, and written in simple language so you can understand it.

(Privilege of consulting Automobile Engineers of American Technical Society for one year without cost if you mail coupon immediately.)

Send promptly and we will include an EXTRA volume with over 300 pages including late cars with wiring diagrams and data sheets on each.

AMERICAN TECHNICAL SOCIETY (Publishers—Home Study Courses), Drexel Ave. & 58th St., Dept. A6320, Chicago, Illinois.

I would like to see the 6-volume edition of your AUTO BOOKS. I will pay the few cents delivery charges only, but if I choose to, I may return them express collect. If after 10 days use I prefer to keep them, I will send you $2 and pay the balance at the rate of only $3 a month, until $24.80 is paid. Please include consulting membership and extra Volume No. 7, as per your offer above.

Name _____

Address _____

City _____ State _____

Please attach letter stating age, occupation and name and address of employer and that of at least one business man as reference.

RADIO-TELEVISION

Oldest, largest Radio-Television school in West trains you for good pay job. Complete instruction including Radio Construction and Service, Broadcast Operating, Sound, Talking Pictures, Television, Public Address, etc. Flexible plan to meet specific needs of those with or without jobs. Transportation allowed to L.A. Earn room and board while learning. Request Free Catalog.

NATIONAL SCHOOLS Dept. MMR-9 LOS ANGELES

HAVE YOU SOME SPARE ROOM

a basement or garage where you can do light work? We can offer you a profitable proposition, casting 5 and 10c Novelties, Ashtrays, Toy Autos, etc., as manufacturer for firm of many years standing. No experience necessary as we furnish full instructions with moulds. If interested in devoting spare or full time to profitable work write AT ONCE stating age and space available as we are now closing arrangements for 1940 supply of our goods.

METAL CAST PRODUCTS CO. Dept. 2
1696 Boston Road New York, N.Y.

BROADCASTS YOUR VOICE LIKE A RADIO STATION—

to any ordinary radio within 100-150 ft. away! Between rooms, apts., houses, autos, offices—almost anywhere! No electric plug in—**NOT AN ATTACHMENT OR TOY!** Ready to operate with self-contained batteries, "Mike Phone", tubes, and attachable "Magicterna" (eliminates aerial). Size only 3x4½x1½". Wt. 22 ozs. Simply connect and broadcast to nearby radios or other "Tinydynes".

ONE YEAR GUARANTEE!

Also receives many radio stations clearly—**WITH NO CHANGES OR EXTRA WIRES! NEW MODEL** broadcasts and receives on short and standard wave! Anyone can operate it with our simple directions. A barrel of fun and amusement for everyone. **Many practical uses!** Finished in beautiful color crackle steel case!

SEND ONLY $1.00 (Check, M. O., Cash) and pay $4.99 plus postage on arrival. **ORDER NOW!**

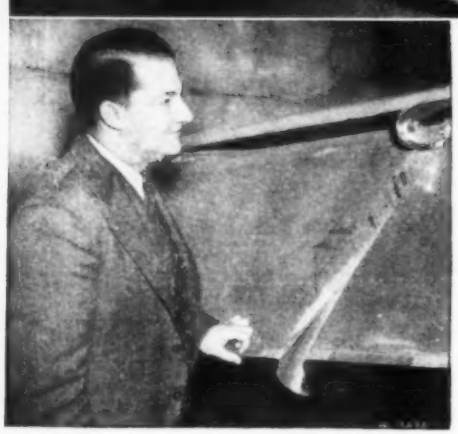
MIDGET RADIO CO., Dept. TM-9, Kearney, Nebr.

Vol. XXIV
No. 5

MECHANIX ILLUSTRATED

SEPTEMBER
1940

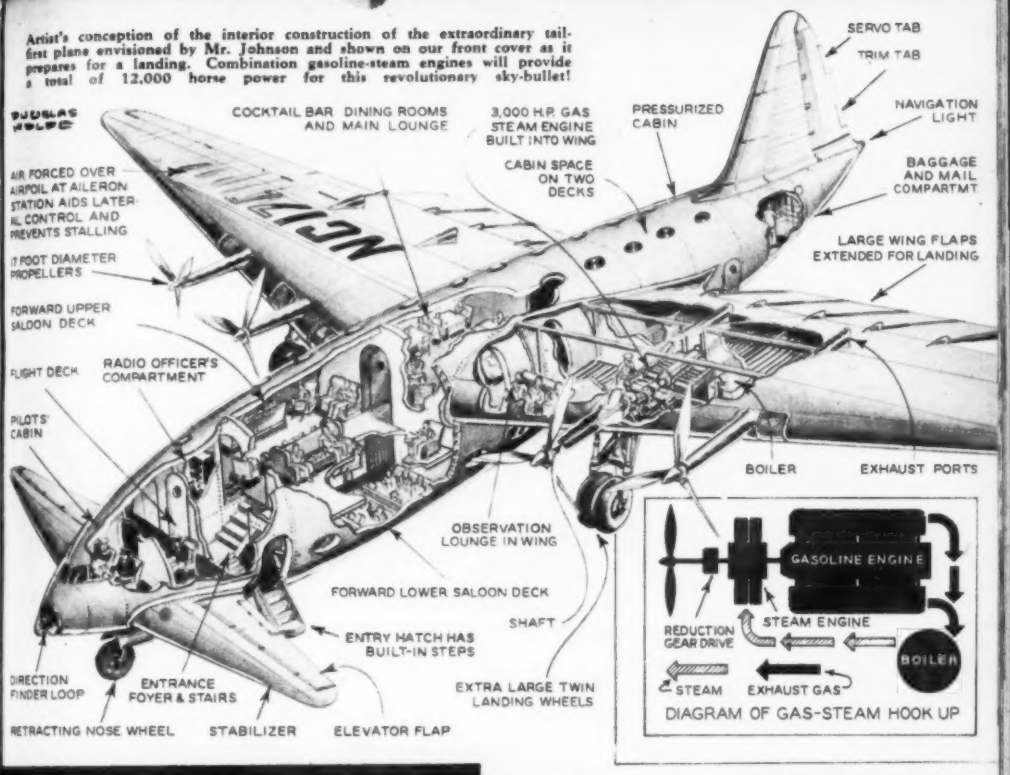
Los Angeles to London —Dawn to Dusk!



Above: Thundering over a speed course at 240 miles per hour, a huge four-engine Douglas casts a sharp shadow on the field below—promise of far greater speeds to come. Left: Clarence L. Johnson, the author, examines the Fowler flap, whose application to Lockheed airplanes won him the Sperry award in 1938.

ONE day . . . please don't ask me to fix the date . . . you will be able to step into a heavier-than-air machine in Los Angeles shortly before sunup and sleep that night in London. Fifty-six hundred miles in 10 hours! This may seem a wild Jules Verne dream at the moment, but let me ask: Who among you would have predicted when the Wright brothers flew their tail-first biplane that in 1940 we would have a military airplane capable of hitting 500 miles an hour?

Artist's conception of the interior construction of the extraordinary tail-first plane envisioned by Mr. Johnson and shown on our front cover as it prepares for a landing. Combination gasoline-steam engines will provide a total of 12,000 horse power for this revolutionary sky-bullet!



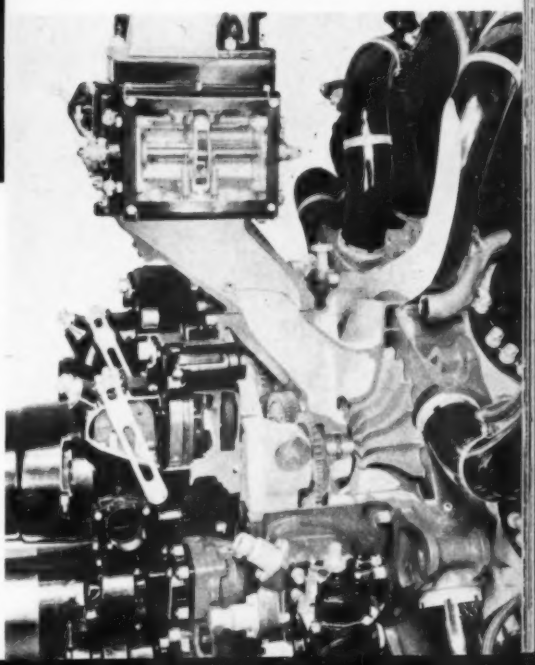
by Clarence L. Johnson

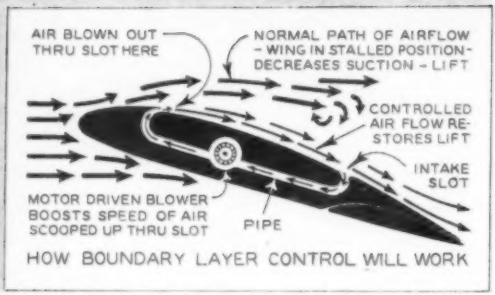
Chief Research Engineer, Lockheed Aircraft Corporation

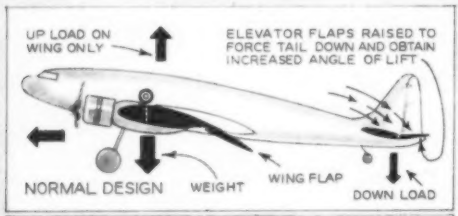
Who says that a tail-first plane with a speed of 560 miles per hour is already taking shape in the minds of practical aeronautical designers.

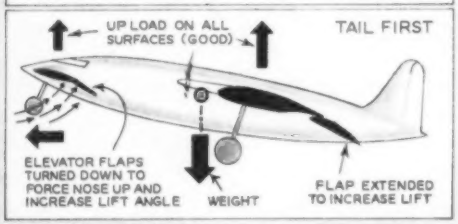
Not only have we achieved undreamed speeds with ever increasing safety, but we are returning to first principles. In the not-too-distant future, you will witness giant transports winging their way tail-first across the continent, then across the Atlantic, then from the Pacific coast of the United States to Britain's capital in a half-day. From these swift ships we may see planes evolve gradually into powerful rockets, climbing swiftly to high altitudes and carrying their passengers at great speeds, perhaps faster than the present apparent limit of 746 miles an hour (the speed of sound) and setting them down gently on distant airports with even greater safety than man flies today. And the safety

Below: This close-up of a cutaway section of a Wright Cyclone 1000 h. p. engine gives some idea of the complexity of an airplane's power plant. Yet Mr. Johnson says that we will soon have engines of three times this size, to push the transports of the future at speeds approaching that of sound itself!




AIR BLOWN OUT THRU SLOT HERE
NORMAL PATH OF AIRFLOW - WING IN STALLED POSITION - DECREASES SUCTION - LIFT
CONTROLLED AIR FLOW RESTORES LIFT
INTAKE SLOT
MOTOR DRIVEN BLOWER BOOSTS SPEED OF AIR SCOOPED UP THRU SLOT
PIPE
HOW BOUNDARY LAYER CONTROL WILL WORK


UP LOAD ON WING ONLY
ELEVATOR FLAPS RAISED TO FORCE TAIL DOWN AND OBTAIN INCREASED ANGLE OF LIFT
NORMAL DESIGN
WEIGHT
WING FLAP
DOWN LOAD


UP LOAD ON ALL SURFACES (GOOD)
TAIL FIRST
ELEVATOR FLAPS TURNED DOWN TO FORCE NOSE UP AND INCREASE LIFT ANGLE
WEIGHT
FLAP EXTENDED TO INCREASE LIFT
HOW TAIL FIRST DESIGN SCORES IN LANDING

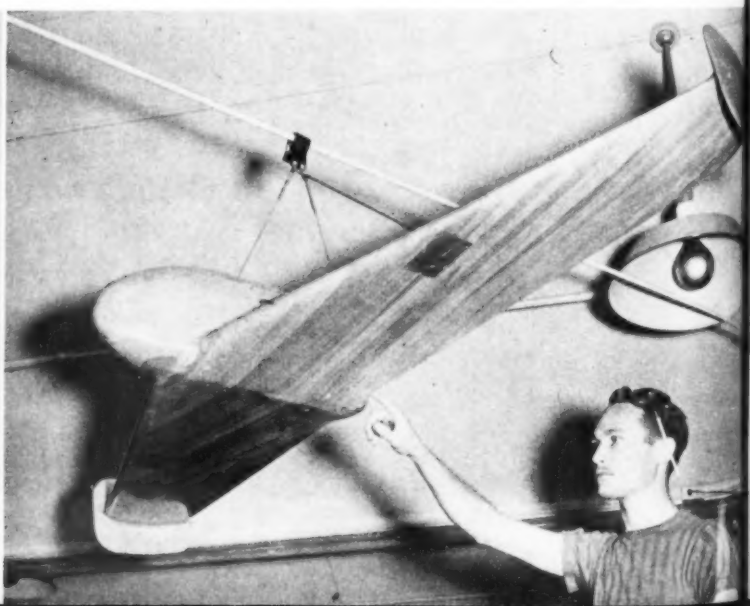
* NOTE UNEQUAL DISTRIBUTION OF FORCES AND GREATLY INCREASED DOWN LOAD ON TAIL OF NORMAL TYPE SHIP

record of American transport operators, I might add, already amazes skeptics who look upon airplanes as dangerous instruments.

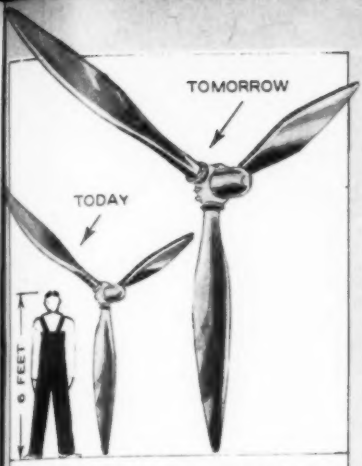
We know the form airplanes will take during the next eight to ten years, for they already are on the drawing boards. Some of these plans envision amazing changes. In certain designs, the tail will be moved from the rear to the front. Engines will push instead of pull. You will see six smaller rather than four larger motors turning three -and four-bladed propellers. Combination gasoline-steam engines may develop from plans now in existence. Ingenious methods for controlling the boundary layer of air around the wings, thus diminishing resistance and adding many miles to a plane's speed, will come. And, perhaps more startling than any of these things, air travellers eventually will ride in airplanes having a wing loading of 300 pounds per square foot!

Hundreds of tests have been made during recent years, investigating the effect of wing loading on transport design. The wing loading, I should explain, represents the total gross weight of an airplane divided by the wing area; it is a measure of the actual load each square foot carries during normal flight. Wing loading affects the flight characteristics of the airplane in that the higher the loading per square foot, the higher the speed at which the craft must fly to carry the load, or the greater must be the angle of attack at which the wing meets the air.

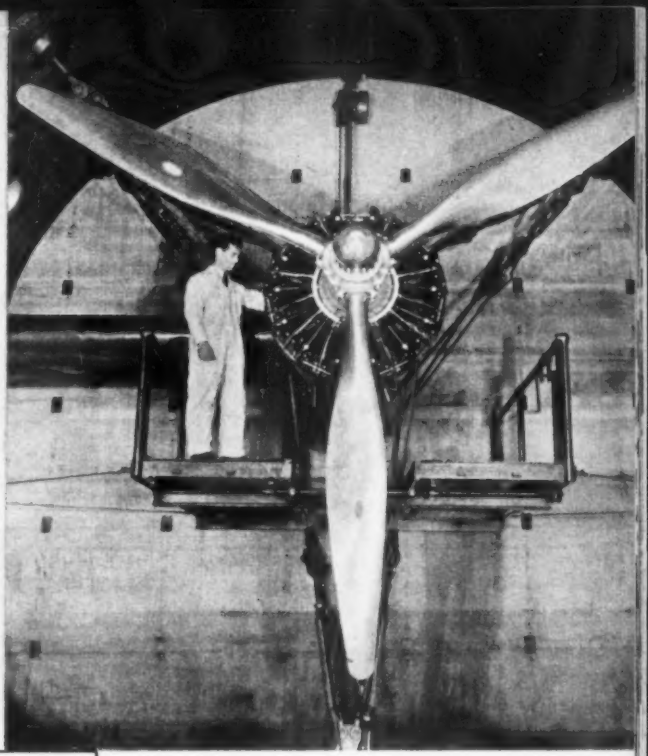
What does a 300-pound wing loading mean? This tremendous value will be appreciated



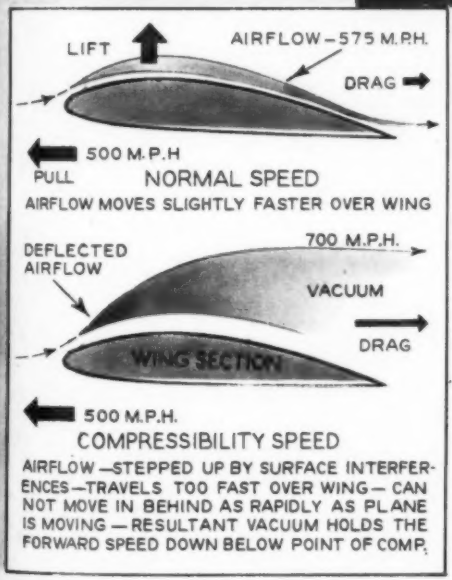
Right: Model of a "flying wing" developed by Lockheed engineers. Note the vertical control surfaces at the wing tips and the complete absence of conventional body structure. This design has been the subject of much discussion, but it is not likely to leave the drawing-board stage for some time yet because experiments indicate the need for an additional stabilizing medium either in front or behind.



PROPELLER SIZES COMPARED



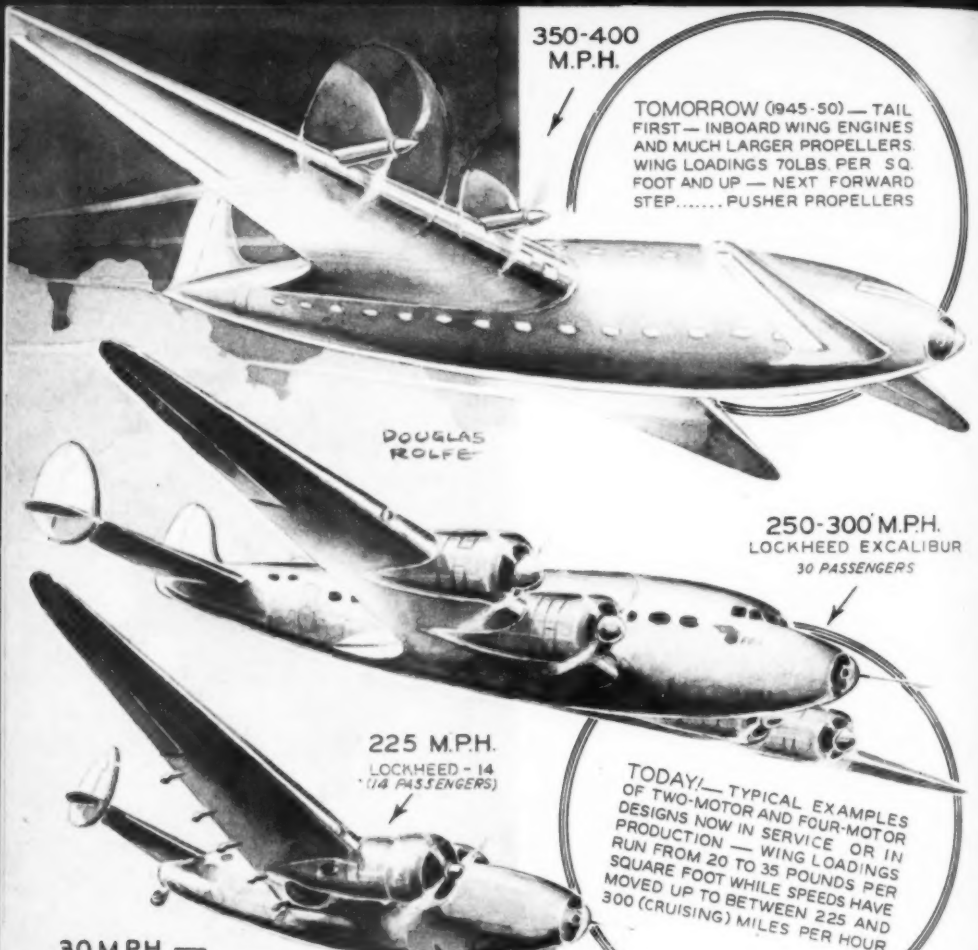
Bigger airplanes need bigger engines and bigger engines need bigger propellers. The photo on the right shows the Hamilton 17-foot giant, designed for power plants up to 2400 h.p. The engine in this picture is a 1200-h.p. Twin Wasp; note how it is dwarfed by the propeller itself.



better when you recall that birds and powerless gliders soar on a wing loading of about three pounds; typical transport plane loadings vary from twenty to thirty-five pounds. When we multiply today's loading nine to fifteen times, we must use smaller wings, engines of greater power and fly at much faster speeds. These conclusions are inescapable.

High-lift flaps developed in recent years facilitate the maneuvering of an airplane with high wing loading during takeoff and landing, which tells us we can land these fast ships at speeds only a few miles faster than is practiced today with transports of all types. In a short time power from the engines will be used to control the flow of air around the wing in such a manner that even the minimum speed factor will be a function of power.

Let me tell you about this amazing development, because boundary layer control probably will make it possible for engineers to increase wing loading to 70 pounds per square foot within the next five years. When a wing moves forward, the air forms invisible patterns along its surface, the amount and type of turbulence depending upon the form and thickness of the wing, the velocity and other factors. By placing an intake slot near the trailing edge and scooping up some of the air, piping it forward and blowing it out again near the leading edge, we shall be able to attain a high degree of lateral control and thus avoid normal wing stalling. High-lift

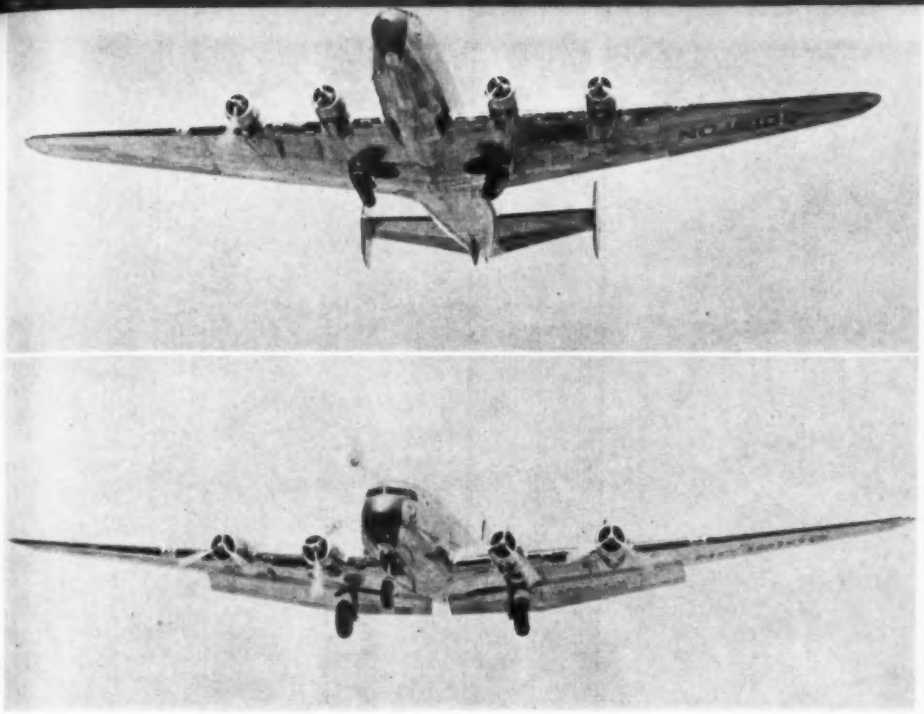

350-400 M.P.H.
TOMORROW (1945-50) — TAIL FIRST — INBOARD WING ENGINES AND MUCH LARGER PROPELLERS. WING LOADINGS 70LBS. PER SQ. FOOT AND UP — NEXT FORWARD STEP..... PUSHER PROPELLERS
DOUGLAS
ROLFE
250-300 M.P.H.
LOCKHEED EXCALIBUR
30 PASSENGERS
225 M.P.H.
LOCKHEED - 14
(14 PASSENGERS)
TODAY!— TYPICAL EXAMPLES OF TWO-MOTOR AND FOUR-MOTOR DESIGNS NOW IN SERVICE OR IN PRODUCTION — WING LOADINGS RUN FROM 20 TO 35 POUNDS PER SQUARE FOOT WHILE SPEEDS HAVE MOVED UP TO BETWEEN 225 AND 300 (CRUISING) MILES PER HOUR
30 M.P.H

YESTERDAY (1903) — THE WRIGHT IDEA / WORLD'S FIRST PRACTICAL AIRPLANE HAD TAIL IN FRONT AND LARGE SIZE GEAR-DRIVEN PUSHER PROPELLERS (POINTS LONG RECOGNIZED AS SOUND DESIGN AND NOW ON THE WAY BACK) *WING LOADING WAS UNDER 3 POUNDS PER SQ. FOOT ON THE EARLY 12-20 H.P. WRIGHTS AND MAXIMUM SPEED DID NOT EXCEED 30 M.P.H.*

The ascending scale of passenger airplane performance is protrayed here, starting with the original Wright biplane. The more immediate possibilities for the future as described by Mr. Johnson are illustrated at the head of the page. After this will come pusher-type propellers, thus completing the reversion to the Wright brothers' conception of aerodynamic design; much later, we will have the "flying wing."

flaps at the trailing edge will give further control. Together, these devices will bring into use a highly tapered wing. As another possibility, control of the boundary layer also will make possible use of thinner wings of very efficient air-splitting design.

You no doubt have read incredulous stories about forthcoming rocket trips to the moon and other planets outside the atmosphere of this earth. Engineers, supposed to be hard-headed and practical, give little thought to these proposed flights into the outer vacuum. Some of us do visualize the day when rocket ships will be carrying passengers, mail and express around this globe. But we must hurdle a number of more immediate obstacles before we reach the rocket stage.



These are pictures of the same airplane, but how different they look! The top photo shows a Douglas DC-4 just after take-off. The forward wheel of the tricycle landing gear is already folded up in the nose and the other two wheels are about half way up. The ship is pointed up and is seeking altitude. The lower picture shows the plane almost leveled off for a landing. The wheels are down in position and the landing flaps are fully lowered. The size of these flaps isn't generally appreciated, as few people are able to watch the landing of this plane from the same position that this picture was taken.

What of the next ten years? First, we're going to achieve greater safety with the Lockheed Excalibur, the Douglas DC-4 and the Boeing Stratoliner, all of which will reach various airlines during coming months. Present transports utilize about 75 per cent of their engine power at cruising speed. The new types will operate normally at half-power, leaving a mighty reserve available at a touch of the throttles for taking off, climbing and other maneuvers.

Following these ships, we'll move on to another series employing engines of 2500-3000 horsepower each, so efficiently designed they will hit close to 400 miles an hour (top speed) at an altitude of five miles. These planes will weigh from 75,000 to 100,000 pounds. About that time, we may move the tail surfaces, now conventionally at the rear, forward near the nose.

Why do we plan this seemingly daring innovation?

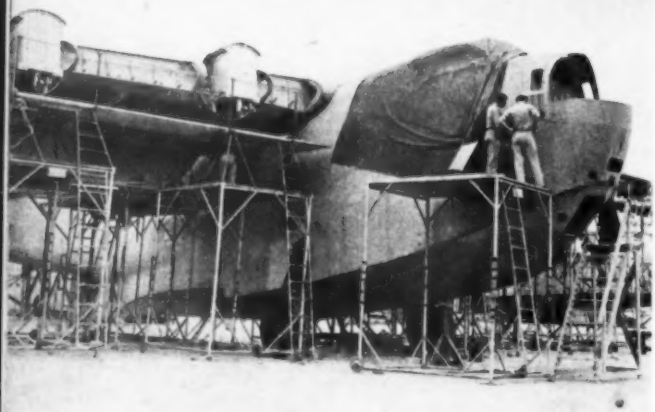
In landing with flaps down, a routine procedure, the pilot forces the tail down until the plane assumes a high angle attitude for maximum lift. This adds enormously to the down load on the tail while applying an up load on the wing. By placing the tail ahead, we obtain an up load on both the tail and wing. Thus we lift the entire structure, no longer working against ourselves as at present.

This brings us back to the Wright brothers' original idea, which we long have known to be aerodynamically sound but for other practical reasons have avoided.

Earlier I mentioned engine power. Such predictions cannot be made without some qualification, because we do not yet know definitely whether four larger or six smaller propellers will prove more efficient for an overall design. In any event, by 1945 we will have in service transports operating at 350 miles an hour, flying five miles up, passengers comfortable in pressurized cabins. These planes will fly on wings stretching 175 feet from tip to tip, will weigh 135,000 pounds and have a wing loading of 55 pounds. We're moving up already!

By that time, we'll be installing engines of

[*Continued on page* 128]



Too Big To Keep Indoors

THIS tremendous four-engined Consolidated Navy patrol bomber is being completed outside the factory. As the company has $80,000,000 worth of planes to build in a hurry, the big birds are turned out of the nest at an early age to make room for unfinished ones. Once the main structures are covered, exposure to weather can do no harm. Small shed-like covers can be seen on the front of the wings to protect the engine supports.

The Blackboard Is Now Green

A NEWLY developed glass chalkboard known as "Nucite" is being demonstrated in the photo at the left. The upper sample, upon which the comely teacher is inscribing her mathematics, is a cheerful green. The light panel is of the same material with an ivory hue, requiring colored chalk. The lowest panel is of the conventional black type. When not used as a chalkboard, this new glass product can serve as an efficient screen for movies shown in school.

Tanks For The Ferry Ride

A GROUP of Massachusetts Sea Scouts are shown here aboard an amphibian tractor built by Donald Roebling. A giant war tank based on this design will soon be built for the U. S. Government. The new monster will be able to carry 40 soldiers and 7,000 pounds of equipment at 25 miles per hour on land and 8½ on water. The Navy Department is believed to be interested in it for use in landing troops from ships.

New Process For Color Prints

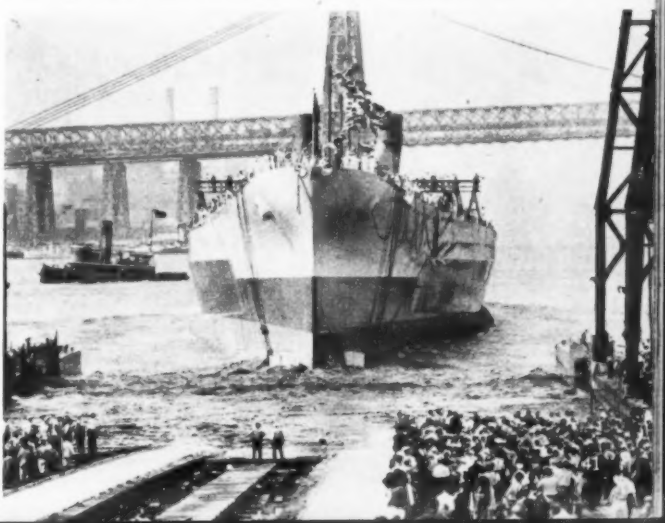
THE jars in front of the lady with the paint brush contain newly developed dyes for coloring photographs. Utilizing a white creamy substance known as "liquid paper" this process turns out colored prints comparable to those made by natural color methods. The dyes are applied with a brush and are absorbed by the photograph to a depth of color proportional to the light or dark values of the black and white print.

Tenting Tonight— On The Baggage Rack

A NEW zipper-tent or "Koop Kamp" as its inventor, Ray Howes, calls it, can be assembled in two minutes. It contains an air mattress for two people, shelves, lights, and a folding table. The car need not be altered in any way to accommodate the tent and may even be driven with the tent erected. When folded, the entire outfit can be stored in the car's luggage compartment with plenty of space to spare for other baggage. It should be popular with fishermen.

54,000 Pounds Of Grease Launch U. S. Battleship

THE 35,000 ton Battleship "North Carolina" is shown here just as her 714 feet of hull finished the slide down the ways. Many thousands watched as the new addition to Uncle Sam's Navy took her first bath after the launching ride on 27 tons of grease. The vessel will carry 16-inch guns in three turrets. A full year is expected to be necessary for the completion of the work on the ship before placing it in service.



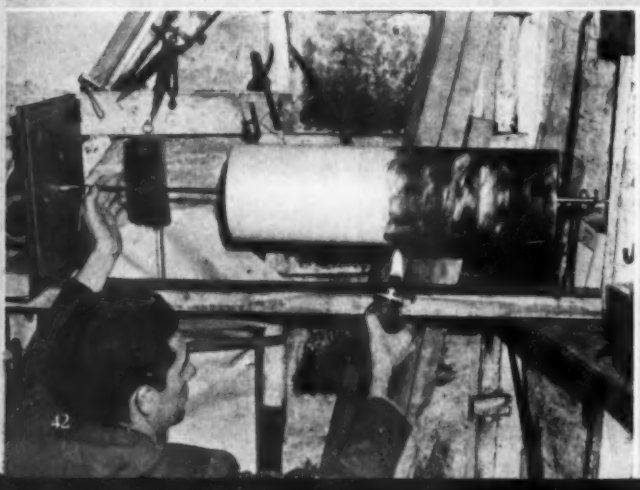
Mr. Murray's backyard observatory. The telescope body which he is examining was made from an old water pipe. A 12½" mirror, ground by the builder to a focal length of 120", captures the constellations for him.

Heaven In His Own

IT HAS been said that a true scientist can build a laboratory of matchsticks. Martin G. Murray of Huntington Beach, California, has not gone quite that far, but he has one of the most extensive amateur seismological and astronomical laboratories in his back yard, built largely from discarded materials.

Take his telescope, for instance. It is a reflecting type, with a 12½" mirror and a 120" focal length. The mirror, he ground himself, and mounted in an old piece of redwood water pipe. The whole telescope was then mounted on an automobile chassis, cut down to fit, and set in swivel.

The same is true of his heliometer, an ingenious instrument for studying the surface of the sun without excessive glare. It consists first of a reflecting mechanism, which catches the sun's image and focuses it a distance away. This too is in swivel, and the swivel looks suspiciously like a universal joint. A darkened surface is necessary to catch the sun's image. This is supplied by a large cardboard mailing tube, with a rigid piece of heavy paper fastened over one end.



Here the cellar scientist uses a small lamp to apply the soot to the seismograph recording cylinder.

Above: The homemade heliometer is shown being focused. Notice the automobile parts used in its construction. Auto precision aids. Below: The seismograph, itself. The concrete block upon which it stands is plainly visible in the background as are the operating wires.

Back Yard!

The same holds true of his home-built seismographic instruments. He has three of these, one for local quakes, and two which record tremors in any part of the world. They consist of a block of concrete, set isolated in the ground, to which attaches an upright pole. Vibrations go through here, and are carried by sensitive wires to the instrument itself. The recording portion is a drum, covered with a sheet of white wrapping paper, blackened by soot. On this rests two sets of double needles—ordinary sewing needles—which are moved slowly across the surface by clockwork. If there is a tremor anywhere, the waves affect this delicate mechanism, and are translated into wave-like scratches in the soot.

Not many scientists, even professionals, are both astronomers and seismologists. Perhaps that is why, by combining his knowledge of both fields, Murray has been able to make researches in the prediction of earthquakes which may be revolutionary, if his hypotheses are confirmed.

In going over his records, he was struck by

[*Continued on page* 138]

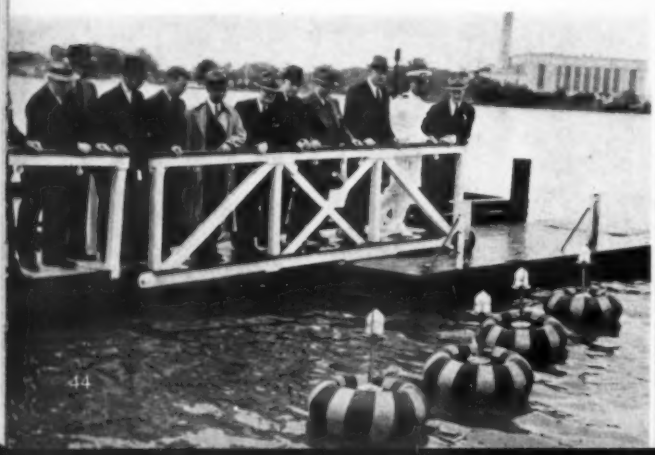
The general control panel and instrument board for coordination of the many scientific instruments.

The Belle Of The Boomerang

THE boomerang this attractive young lady has just launched will perform a series of aerial gyrations and then swoop gracefully down and alight in her hand—or at her feet if she misses. Having acquired her technique from an Australian bush country native, she is one of the few boomerang experts of her age in this country.

100 Hour Pocket Radio

YOU park it in your pocket and it warbles while you walk. This tiny battery radio is only 6¼ inches long. The batteries, which are of standard size, will last for 100 hours of operation. Weighing approximately 1½ pounds, it is easily carried in a jacket pocket.



These Doughnuts Are Not Sinkers

THESE rubber doughnuts are Westinghouse radio controlled floating lights, to guide seaplane landings. The batteries for the lights are contained in the base with a small radio held up by the rubber float. To conserve the batteries, short wave transmitters control the lights from shore.

Mechanix Illustrated

Going Nowhere At 150 M.P.H.

WHILE the wheels spin madly, this powerful racing car parks placidly over the pit. The battery of instruments at the right records every reaction of the entire running mechanism as the theoretical speed increases. The fan at the front of the pit supplies the cooling air for the engine's radiator. This laboratory tests many racers at a standstill.

It's An Old Shell Game!

THIS young lady is loading a mechanical egg-breaker. The imposing array of apparatus not only breaks the eggs, but discards the shells, separates the yolks from the whites and deposits each in a separate bucket. The need for the separate portions of the eggs by different branches of the baking industry necessitated the egg-breaker.

She'll Go Far— On One Gallon

MISS BETTY ROBINSON grins from her perch atop this ultra modern miniature motorcycle. The sidecar is a replica of a full sized one in common use. The engine boasts 1½ horsepower and a maximum speed of 18 miles per hour. A compensating factor for the low speed is the excellent mileage attainable, approximately 90 miles to the gallon. The sidecar is supported by both leaf and coil springs.

Diving With DEATH

by J. Julius Fanta

A SURGE of tide, backing out swiftly, swung the surface ship *Silver Heels* from its position directly over the sunken *S. S. Port Hunter*, seventy-six feet down off the Massachusetts coast.

Moments before, Max Gene Nohl, ace deep sea diver and under-water photographer, had been standing ankle-deep in the ooze on the deck of the *Port Hunter*, taking underwater atmosphere shots for a motion picture production. Air pumps on the *Silver Heels* had been pumping down sufficient pressure to keep his suit inflated and resist the pressure of the water at the depth he was working.

When the *Silver Heels* swung around, the diver's life-line snubbed and Nohl was jerked suddenly from the foredeck of the sunken ship. His footing gone, he began to sink into a great 150-foot hole beside the ship. The telephone line had snapped, so the crew on the surface ship was unaware of his plight

Left: No, it's not a man from Mars, but Max Gene Nohl wearing a "lung" for diving as deep as thirty-five feet. Oxygen and air carried in tanks are breathed and exhaled through the mouth. On top of the unit is a cannister containing chemicals for purifying the exhaled air for re-use. Below: Self defense against undersea enemies is of prime importance; Max Nohl carries a compressed-air shark gun.

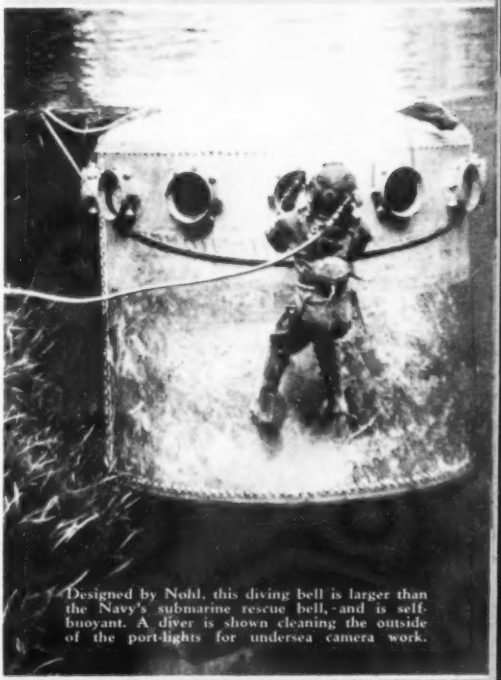
For Undersea Films!

When Max Gene Nohl hits bottom, he's on top of the world! This ace undersea diver and submarine cameraman has had enough close scrapes with death to last a dozen men, but he's still looking for new worlds to conquer on the ocean's floor!

and he had no way of informing them. As he sank deeper into the hole on the ocean floor, the increased water pressure began to squeeze him with a vise-like grip.

Deep in the black hole, Nohl reached up and, with his last remaining strength, jerked the lifeline four times—the signal to "pull in fast." The crew knew this signal meant life or death and they hauled in rapidly; their quick work saved the day. Max Gene Nohl arrived at the surface with crushed shoulders and chest—but alive!

While an experience like this is not exactly "all in a day's work" for an undersea diver, it is a perfect example of what a man like Max Nohl may expect to face at any time when following his precarious profession. He has



Designed by Nohl, this diving bell is larger than the Navy's submarine rescue bell, and is self-buoyant. A diver is shown cleaning the outside of the port-lights for undersea camera work.

Nohl picks up the "guide line" leading back to the foot of the descending line. The helmet he is wearing is rubber.

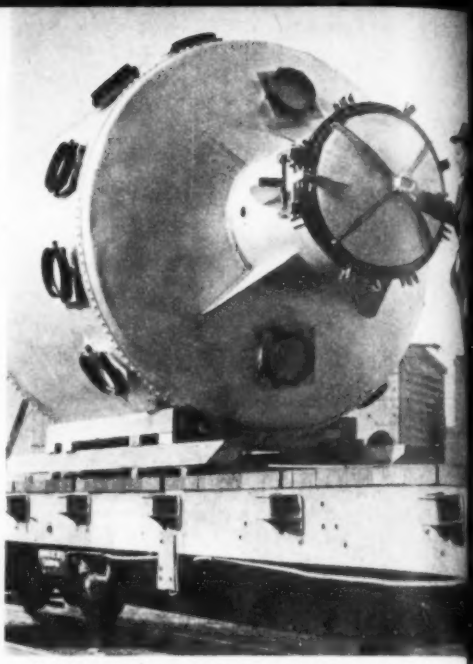
flirted with death so many times that he has come to think of the Grim Reaper as almost a second cousin!

Only last year, while filming the salvage of the captain's safe from the sunken liner *Valbanero,* off the Florida Keys, Nohl had another close shave. The ship, which foundered eighteen years ago with 550 passengers aboard, rested on an even keel at the bottom. To get the safe, it was necessary to cut straight down through the deck to make a clear path to hoist it out.

Underwater acetylene torches were used by Nohl's aides to cut away as much of the barrier as possible. Throughout the operations, the scene was illuminated with specially-designed underwater floodlights, while at the camera, Nohl ground away, getting all the operations on film, including the setting up of dynamite charges which were used to blast when the torches proved impractical.

When the dynamite was ready to blast, his crew moved away to a safe distance, but Max Nohl kept his camera dangerously close in order to get sensational pictures. Raising his arm, Nohl gave the signal to blast . . . and hell broke loose under water! The water-logged derelict trembled, then ripped apart with a terrific roar. The debris flew in all directions, and a huge timber landed on the steel-jacketed camera, knocking it over, and ripping and piercing Nohl's diving suit. He was hauled up immediately, but even so, it's a miracle that he lived to tell of his experience!

There was another time when he was down sixty feet in Lake Michigan with Captain John Craig, another noted diver, inspecting the wreckage of the sunken steamer *Norland.* At the same time, they were testing new diving equipment and making one of the first underwater broadcasts over the NBC network.



Nohl's revolutionary diving bell, the largest ever built, is shown here on a flat car, ready for travel.

Over the three-way hook-up with the surface announcer's "mike," Nohl and Captain

In a U. S. Navy deep-sea compressed air diving suit, Nohl is shown firing a pneumatic shark gun. It fires a 24-inch steel dart by air pressure.

At the left is part of the money brought up from the captain's safe of the *S. S. Tarpon*, 100 feet down off Panama City, Florida. On the right is a picture of Max Gene Nohl, deep-sea diver extraordinary.

Craig were describing the wreck. Suddenly Captain Craig's air line fouled on the wreckage, completely shutting off his air supply. Helpless, he lost consciousness and failed to respond to the announcer. Nohl immediately started to search through the wreckage to find his companion and ran across the air hose at the place where it had fouled. He cleared it immediately, but the sudden rush of air from the swollen line blew up Captain Craig's suit like a balloon, and he shot toward the surface. The slack in the sagging lifeline to Nohl's helmet fouled with Craig's air, telephone and lifelines, and he was dragged along after Craig in the snarl, which was climaxed when they both collided with the bottom of surface ship!

Both were rescued, but it was an experience that neither of them will ever forget!

Nohl's biggest "take" from Davey Jones' locker was when he recovered the captain's safe from the *S. S. Tarpon*, down a hundred feet off Panama City, Florida. It was also the scene of one of the most grueling experiences in his career.

While in the officers' quarters of the *Tarpon*, he was trapped by a school of killer sharks. In the company of a number of human skeletons, victims of the *Tarpon* tragedy, Nohl tried to outwear the sharks' patience, but they were blood-thirsty for prey and circled menacingly around the wreck. After two hours of this ghastly siege, the trapped man was almost at the end of his wits and endurance. Then he had an idea!

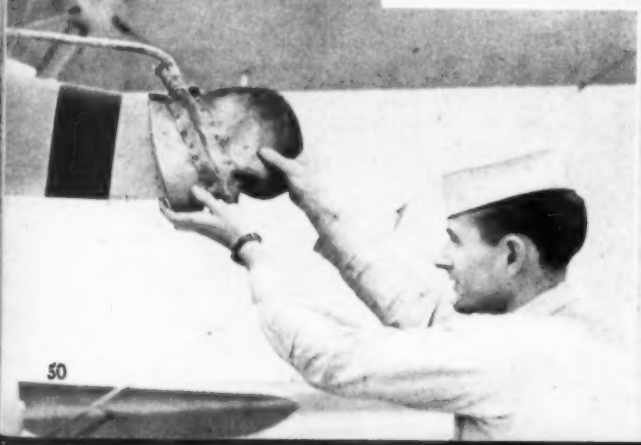
He ducked his head out of the companion-

[*Continued on page* 130]

Looking like some weird creature of the deep, Max Nohl swims along the surface wearing his diving lung.

Portable Filter For Thirsty Campers

WEIGHING less than 40 pounds, this pack filter assures pure water for camps, without the need of a large tank or bulky equipment. Completely self-contained, the unit is equipped with a hand pump and filter plates. It can deliver as much as 5 to 6 gallons a minute.



Starter's Understudy —Is A Truck

WHEN the starters of Naval Reserve planes at Floyd Bennet Field fail to work, a truck does the job. The canvas mitten with shock cord attached is slipped over the propeller tip, as shown at the left. The other end of the shock cord is fastened to the truck, which moves, starting the motor.

Phones Show A Profit In Fun!

WHAT is probably the world's largest, and certainly the world's lowest-rate home-made telephone exchange has been built by three youngsters along the Mississippi river in Minneapolis.

Now about three years old, it has already set a world's record in low cost of equipment and maintenance. Its monthly bill per each of its 15 customers —10 cents—is also unique.

There are now two exchanges, one in Minneapolis, which is one-half mile long and services nine phones. The other, in St. Paul, is a six-phone affair.

A five-cent battery supplies the power for conversations, and a magneto attached to each phone unit supplies power for the bell. Each party has a certain ring, rather than a number. To use his phone, the customer first listens in to see if the line is in use. If it isn't, he hangs up and spins the magneto to produce the desired signal. When his party answers, the magneto bell stops ringing and, lifting off the receiver again, the customer is in contact with his party and everybody else that feels like listening in; spinning one magneto sets off all the bells on the exchange.

The vice president tests the main line in the company's home-made research laboratory and office. Note magneto in foreground.

About half the phones are installed in basements of users, the other half at bedsides. The company offers a switch for bedside phones which automatically disconnects the

[*Continued on page* 138]

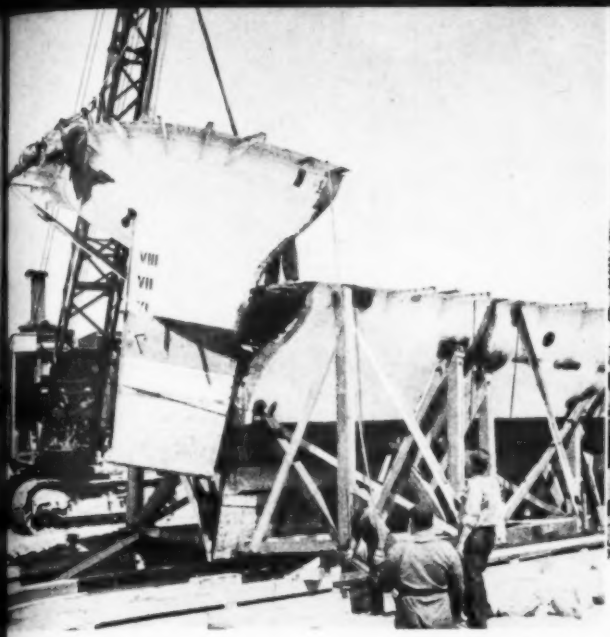
Right: The company's president does a little trouble-shooting on a field phone while checking a customer's line. Below: Chief Engineer Piccard demonstrates the bedside service and the magneto.

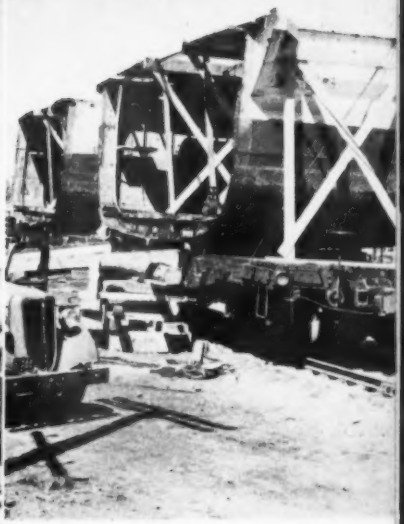
Building Ships By The She

A BRITISH power boat company, under contract to the government, has equipped a large training center for women. Ranging in age up to thirty-five, these enterprising young ladies are trained in an old English mansion recently converted for that use. Their instruction covers sheet metal work, electrical work, and all phases of woodworking that pertain to boat construction.

A Bird In The Hand

AH FOOEY, a tame humming bird, shows his affectionate nature and his appetite by eating out of Peter Reiner's mouth. In the left hand picture Ah Fooey is shown sipping milk from a spoon held by his owner. The bird was rescued as a mere fledgling while attempting to escape on untried wings, from an efficient neighborhood cat. During the year he has remained with his rescuers, Ah Fooey has grown quite tame.





Sliced Ship Shipped —On Freight Cars

THE photos above show the *Washington II*, as shipped 300 miles by freight. The ship was "sliced" into 21 sections to fit on the railroad cars as shown. The total length of the vessel assembled is 205 feet. The upper left hand picture shows the stern of the craft being hoisted into place during the reassembly. Welded together again, experts say the hull will be stronger than before.

Modern Slumber In A Bedinette

THE creation of John T. Holt, an attorney whose hobby is furniture designing, this bedinette is undoubtedly the most convenient sleeping and resting luxury yet devised. Lights, liquor, radio, literature, chinaware, the correct time and cigarettes are available in its nooks and crannies.

LIGHT PLANE DIRECTORY

Above: Funk Monoplane of Akron Aircraft, Inc. Two passengers, $1950. This plane is based on the original design of the Funk brothers, two young engineering students. Note starting-crank's accessibility.

Right: American Flea Ship of Universal Aircraft Co. Inc., of Fort Worth, Texas. One passenger, $243.50 to $490. Various engines.

Piper Cub Cruiser. Accommodates three passengers. $1798. Other Piper planes for two passengers, from $995 to $1995. Piper Aircraft Corporation, of Lock Haven, Penna.

Do you want to buy a plane? Here is a wide selection of modern, inexpensive aircraft to choose from. The initial cost of many of them includes free flying instruction. In all cases lessons may be had at a very reasonable figure. Your nearest dealer will be glad to give you a demonstration flight if you are interested. Now pick out your airplane!

Aeroncas of the Aeronautical Corporation of America, Cincinnati, Ohio. Two passengers, prices from $1565 to $1795.

Dart, a low-wing monoplane by the Culver Aircraft Corp., Columbus, Ohio. Two passengers, sells for $3650. Radial engine and dual controls.

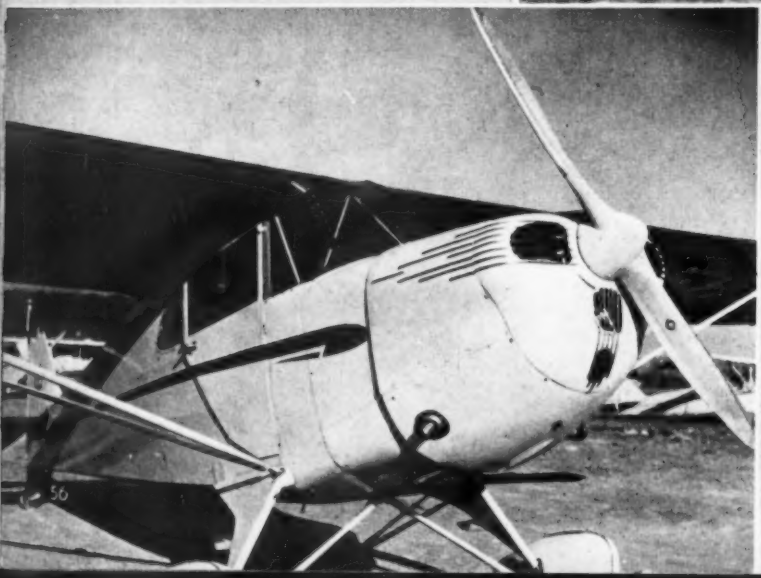
Below: An Aeronca with an aerial camera. Many light ships are ideally suited to photography. Economical mileage helps.

Right: Piper Trainer. This rugged little two passenger job sells for $995. Although a trainer, it is also a sport plane.

Above: Luscombe Silvaire. All metal construction, two passengers, $1893 up.

Left: A Taylorcraft Trainer. Two passengers, priced at $1495. Taylorcraft builds six other models ranging in price from $1660 to $1835. All high wing monoplanes.

Above: A De Luxe Model Aeronca. The price of a plane like this varies with equipment. Priced around $1795.



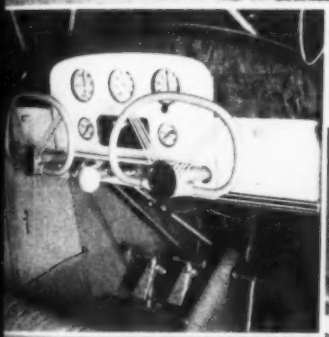
Above: Piper Cub Coupe. Note rear window for back seat flyers. Auto type door.

Left: Nose of a Piper plane. Auto style grills are making their appearance on many of the new private airplanes.

Above: A Porterfield Model 50. This plane varies in price according to equipment and finish, from $1495 to $1695. It is a two passenger trainer and sportster. Built by Porterfield Airplane Co., Kansas City, Mo.

Above: Climbing the clouds with a "Cub." High altitudes are easy for modern planes.

Above: A Porterfield Model 60. This little two passenger sporting plane sells from $1775 to $1975.



Above: The instrument panel of the 1940 Aeronca Deluxe. The modern private airplane embodies automobile luxury of interior to enhance flying comfort and enjoyment.

Right: The new Stinson "105." A three passenger private type airplane built by the manufacturer of many large cabin planes. $3370 with 80 h.p. engine.

Below: The Deluxe Taylorcraft. Planes of this type are equipped for extended trips "cross country." Streamlined fairings increase speed and cruising radius.

New Metal Plane Won't Tailspin

THE Ercoupe, a new all metal plane for two passengers, is guaranteed by its manufacturer to be non-spinnable. Powered by a 65 horsepower motor, the ship attains a top speed of 117 miles per hour and cruises at 105. An average rate of gasoline consumption of 26 miles to the gallon is reported. Special provisions of design permit the complete elimination of the plane's rudder pedals if the owner desires.

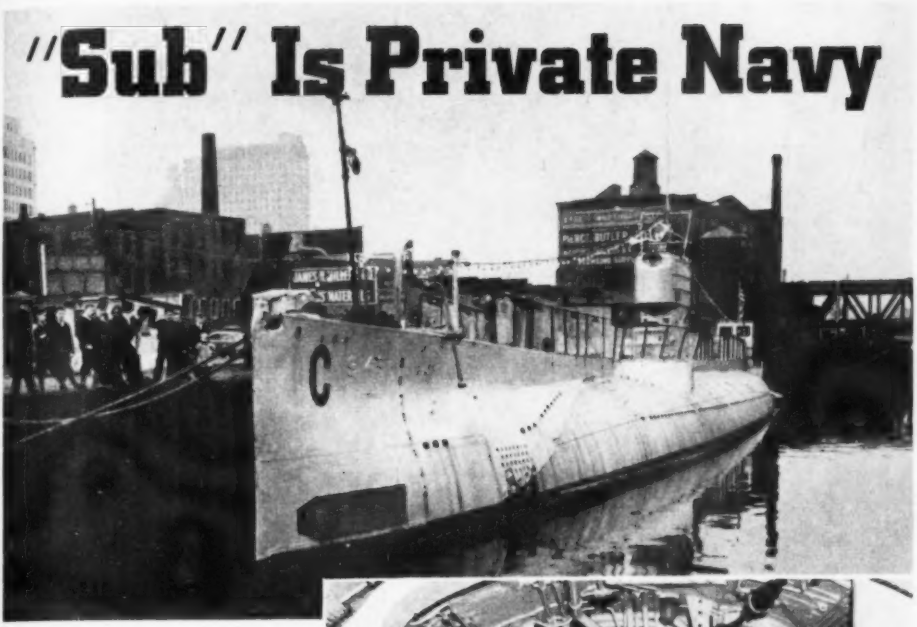
New "Eyes" For Hams With Television Bug

THIS young radio experimenter, or "ham," is focusing the new type "eye" tube on the call letters of his amateur television station. This new tube is an inexpensive and much simplified version of the iconoscope tube familiar to radio builders. It is expected to open the television broadcasting field to a large number of amateurs hitherto unable to indulge in that type of transmission because of the expense. The pictures sent by this tube are of newsprint quality.

When The Cows Come Home—

ELSIE is a good girl. At the left, she can be seen standing in her bed at the Borden exhibit at the New York World's Fair. The satin-covered chaise longue is built from a wheelbarrow. The chandelier is a wagon wheel adorned with lanterns and corn cobs. A feed box has been transformed into a writing desk, and a butter churn into a lamp. Elsie goes to the rotolactor for milking like the other cows—but her blanket has gold fringe.

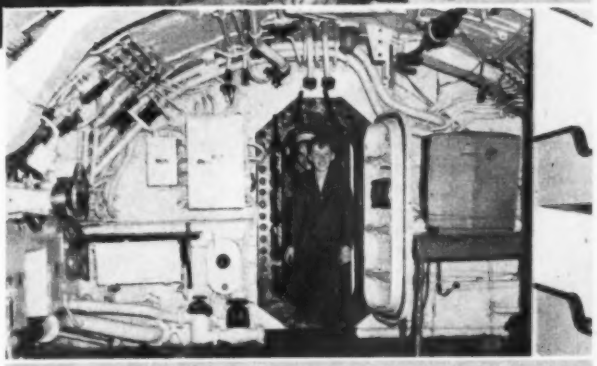
"Sub" Is Private Navy



The S 49 open for inspection.

SUBMARINE S-49, formerly a part of the U. S. Navy's fleet of undersea craft, is now owned by Captain F. R. Christensen. Having been sold for $40,000 with the provision that it could not be re-sold to a foreign government, the sub must be operated in accordance with restrictions placed upon it at the time of sale. Capt. Christensen must radio his ship's arrivals and departures to Washington. The absence of the $100,000 diving batteries, which were not included in the sale, prevents the sub from diving.

Thousands of people have visited the ship, which is now operated as a floating exhibit. On trips from one coastal city to another, the sub is towed by a tug, a procedure more economical than operating the submarine's own high powered diesel engines. A large percentage of the visitors who pay for the inspection tour and lecture on the sub are children.



Some young visitors examine the crew's quarters and torpedo room.

"HAUNTED HOUSES"

One of the houses of "Tiny Town" opens up to allow visitors to view the interior, while at the same time a voice extols the virtues of the building. Below: Mechanics install Magnetrol valves, which regulate the air pressure working the pistons that open and shut the houses.

A VILLAGE with houses that speak when they open up to show their interiors, a garden where flagstones and benches protest unhappily when they are walked or sat upon, and striking fountains of flame and water are but some of the novelties offered to visitors at the Gas Utilities exhibit of the New York World's Fair.

The exhibit, staged on a far more spectacular scale than that of a year ago, is called "Gas Wonderland," and has proven one of the big hits of this year's edition of the Fair. Part of the exhibit is "Tiny Town," a complete suburb in miniature, with streets, trees, a church, motion picture theatre, school and all the other buildings, private and municipal, that would make up an average town. There are twenty-one buildings in "Tiny

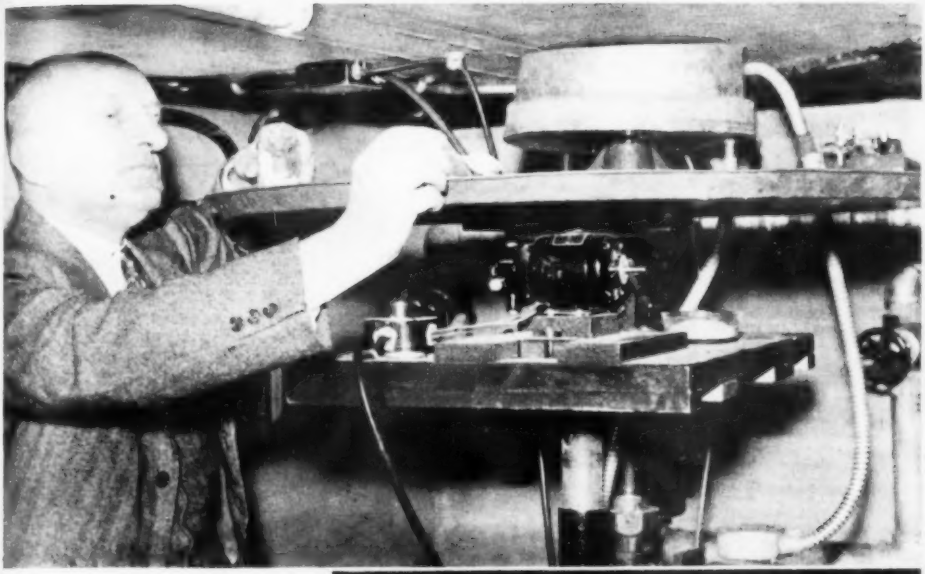
Are Wired For Sound

Above: "Tiny Town" features twenty-one "talking buildings," operated by complicated Robophones.

Above: Stepping on the talking flagstones starts the Robophones, which make caustic comments on the stepper's weight and shoe size. Right: A group of girls listen to the hidden voice in the flagstone.

Left: The heart of "Tiny Town" and the talking flagstones is this room with the Robophones.

Above: A mechanic installs the pistons worked by air pressure which open the parts of the various houses. Below: An electrician puts the final adjustments on a flasher, which synchronizes and activates the lighting in the house interiors, starts and stops the Robophones, and operates the Magnetrol valves which open the houses.



In the "Mystery Garden," shown below, a brilliantly colored flame shoots up from the water fountains. Colors are obtained by feeding solid chemicals into the gas flame. Shown above is the control chamber, where chemically treated sawdust is inserted in the groove of a turntable which revolves once every three hours, thereby creating the multi-colored flame. Only two ounces of chemicals are used for one hour of flame.

Town" which "talk" to visitors as their sides come down or roofs pop open to reveal their interiors.

Outside the building which houses "Tiny Town" is the "Mystery Garden," where visitors are amazed to hear flagstones say, "Don't step on me!" when trod on, or else cry out derisively: "You're no flyweight!"

The heart of "Tiny Town" and the talking garden is a complicated system of Robophones, a phonographic device which electrically controls action from speech on records. An electrical device called a "flasher" synchronizes the lighting of interiors of homes, starts and stops the Robophones and operates the Magnetrol valves which open and close the houses. Many weeks of checking were necessary after the Fair opened before synchronization could be completely mastered, as no similar project encompassing such technical difficulties of this nature could be studied for help on the problem.

This Magazine GUARANTEED!

WE WILL REFUND DOUBLE YOUR MONEY IF YOU'RE NOT SATISFIED WITH MECHANIX ILLUSTRATED! 20c back on a 10c buy.

THAT IS our proposition to you. There are no hidden tricks in this offer. It is honest and aboveboard, made in good faith because the publisher firmly believes MECHANIX ILLUSTRATED is the most interesting, entertaining and informative 10c magazine of its kind on the newsstands.

THE PURPOSE of this money-back guarantee is to get new readers, to call attention forcibly to the magazine as the only mechanical magazine confident enough in the quality of the material between its covers to make such a sensational offer.

ALL WE ask in making this offer is that you give us a "fair shake." In other words, read the magazine thoroughly. Read every story and item in the magazine, then ask yourself this question: "Have I received the value of the purchase price of this magazine in reading entertainment?"

IF THE answer is "YES" then we are thankful that we have pleased you and know that we have you as a steady reader.

IF, AFTER reading this magazine, you do not feel you have received entertainment value equivalent to the purchase price, we will refund **DOUBLE** that purchase price. If you feel entitled to a refund the following conditions must be observed:

1. SEND THE front cover of this magazine by first class mail to Department "R," MECHANIX ILLUSTRATED, 22 West Putnam Ave., Greenwich, Conn.
2. BE SURE to enclose your name and address if applying for the refund. Write a short letter to the editors of this magazine telling them why you do not think the magazine worth the 10c purchase price.
3. THIS OFFER closes September 1, 1940.

You're RIGHT—That's WRONG!

Here are 25 statements, some of them true, the others false. The trick is to separate the *true* statements from the *false* ones—and it isn't as easy as it looks! Use a pen or pencil and check the correct box under each statement and see how you make out! After you've given yourself the test, try it out on friends and other members of the family and compare scores. They'll enjoy it and so will you.

Are you ready? Let's go!

1. Although a giraffe's neck is of such length as to reach into the branches of trees, it has the same number of joints as that of a man.
   True ☐ False ☐

2. Metempsychosis is a serious disease of the mind recently treated successfully by insulin shock.
   True ☐ False ☐

3. A small floating piece of an iceberg is called a calf.
   True ☐ False ☐

4. Although differing widely in appearance from its brothers, the femur is actually a long-legged antelope.
   True ☐ False ☐

5. The voltage of an alternating current cannot be measured by an ampersand.
   True ☐ False ☐

6. Although the circumference of the earth is only about 25,000 miles, an airplane flying at 1,150 feet could travel 41,000 miles directly east if it had sufficient cruising range.
   True ☐ False ☐

7. Nicotine, the active principle of tobacco, is a dark brown, oily liquid, tasteless and odorless in its fluid state.
   True ☐ False ☐

8. Young male wolves are known as "wolverines."
   True ☐ False ☐

9. There are just two amounts below fifty cents which cannot be paid with six coins or less in the U. S.
   True ☐ False ☐

10. Doodlebugs are larval ant lions that bury themselves in sandy soil with their jaws protruding to catch passing insects.
    True ☐ False ☐

11. Orchids grow from bulbs shaped like carrots and colored like beets.
    True ☐ False ☐

12. An oolly of wootz could be used to make tools with a sharp edge to be used for cutting.
    True ☐ False ☐

13. A radial engine is so named because it uses a radiator to dissipate the heat of combustion.
    True ☐ False ☐

14. Although the speedometers of automobiles do not indicate speed when in reverse, they increase the recorded mileage the same as when the car is moving forward.
    True ☐ False ☐

15. The propellers of many modern multi-engined transport planes are designed so that they can be stopped individually if any particular motor should fail.
    True ☐ False ☐

16. An airplane engine having its crankshaft above the cylinders is called an inverted engine.
    True ☐ False ☐

17. A landing strut is the unbalanced gait of an airplane pilot after coming down from a long flight.
    True ☐ False ☐

18. Rivets with explosive tips that burst and expand when heated, are now being used in airplane construction.
    True ☐ False ☐

19. An aerostat is a photostat that has been retouched by an artist with an air brush.
    True ☐ False ☐

20. Even the cheapest electric light bulbs will operate properly on either direct or alternating current.
    True ☐ False ☐

21. The purpose of the spinning motion imparted to a rifle bullet in the bore of the gun is an increased penetrating power due to rotation.
    True ☐ False ☐

22. The images on a motion picture film as it travels through the projector in the theatre are positive images, not negatives.
    True ☐ False ☐

23. A focal plane shutter is one that is located at the back of the camera, next to the film.
    True ☐ False ☐

24. The humming bird, noted for its unusual characteristics of flight, is not a bird.
    True ☐ False ☐

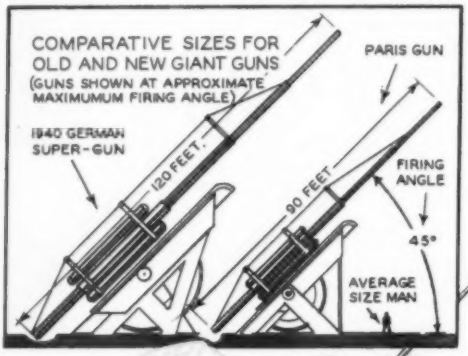
25. A balloon jib is a sail carried aloft by a balloon to enable a sailboat to utilize winds at higher altitudes.
    True ☐ False ☐

WHAT'S YOUR SCORE?

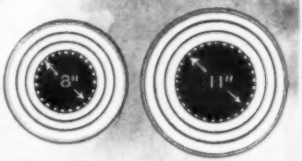
To get your score, simply give yourself 4 points for every question you answer correctly and total the result. If your mark is above 90, you are exceptional; if it is between 80 and 90, you deserve high praise; if it's between 70 and 80, you're good; between 60 and 70, fair; and below 60—well, try again next month!

Answers will be found on page 130

ARE THESE GERMANY'S



PROJECTILE LEAVES GUN AT A STATED MUZZLE VELOCITY OF 6,000 FT. PER SECOND — MORE THAN 4,000 MILES PER HOUR /



PARIS GUN 1940 SUPER-GUN

COMPARATIVE CALIBERS (BORE) OF OLD AND NEW GIANT GUNS

MAP SHOWING AREAS MENACED BY 135 MILE RANGE SUPER-GUN

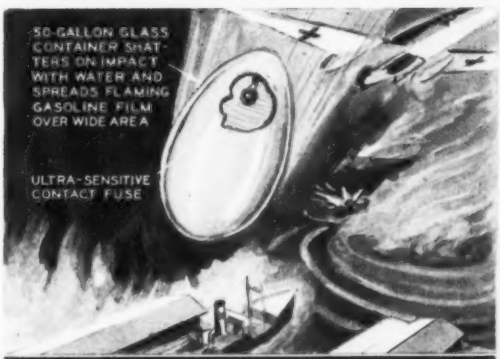
GERMANY'S alleged super-cannon, reported to be ready to shell London from the captured Channel coast, arouse less incredulity now than their ancestors that shelled Paris at 75-mile ranges did when they opened fire in 1918.

Soldiers as a rule do not advertise their intentions in advance, but there is nothing really incredible about the reported dimensions of the new guns, especially when one compares them with those of

SECRET WAR WEAPONS?

CHAIN SLING
Entire tractors and other heavy farming and mining machines are regular cargo in commercial planes now in service in Canada and South America, so it is not at all unreasonable to expect four-engined military ships of special design to carry full-sized tanks and cradles under the fuselage. Since the jump across the English Channel is a very short one, only a small gasoline supply would be needed for the trip.
RELEASED TANK ROLLS AWAY TO FORMING-UP RENDEZVOUS AND CARRIER PLANE RETURNS TO ENEMY BASE FOR RELOADING

COMPARATIVE SIZE—TANK-PLANE AND FIGHTER


50-GALLON GLASS CONTAINER SHATTERS ON IMPACT WITH WATER AND SPREADS FLAMING GASOLINE FILM OVER WIDE AREA
ULTRA-SENSITIVE CONTACT FUSE

GLASS BOMBS FOR ASSAULT ON DOCK AREAS

the long-range Paris guns of 22 years ago. The Paris guns were about 90 feet long for a caliber of about 8.3 inches; the new ones, said to have a length of 120 feet and a caliber of 11 inches, are fairly in proportion. It is quite within the bounds of probability that the Germans could build pieces of this size; the 1918 model was half an improvisation, made by inserting a long inner tube into an

[*Continued on page* 131]

The late John D. Rockefeller, reputed to be the richest man in the world, started his career as a modest bookkeeper. This early training was invaluable to him throughout his business life.

ACCOUNTING

by Donald G. Cooley

MORE than eighty years ago a sixteen-year-old boy, who was earning $3.50 a week as a bookkeeper, invested ten cents in a personal account book. Every penny he spent was carefully noted in the book. Ancient and worn, that little book still is in existence with its hundreds of neat hand-written entries—12 cents to a mission, 10 cents for a religious journal, 62 cents in all donated to his church during the first month.

You might think that a mere boy who kept such accurate personal books would go places in the business world. You would be right.

His name was John D. Rockefeller.

To the end of his life Rockefeller was at heart a bookkeeper. At the end of every day his books told him the exact state of his affairs. It would not be accurate to call him an accountant, for accountancy as we know it is hardly more than fifty years old, but his career illustrates a fact which is truer today than it was when Rockefeller was building his vast oil empire: the man who really understands business is the man who understands its books.

Business executives rarely make important moves these days without consulting accountants. Expansions, mergers, stock issues, production plans, sales campaigns and a thousand other activities revolve around the accountant's hard-headed, specialized commercial knowledge—not to mention his importance in keeping businessmen out of jail in such matters as tax reports and bankruptcies.

That is why the demand for topnotch accountants exceeds the supply, with some companies scouting the colleges for promising accountants just as manufacturers recruit engineering graduates from technical schools. There are some 17,000 Certified Public Accountants (C. P. A.'s) now operating, and practically the only ones who are unemployed are those who have retired or are physically unable to accept a position.

Of course comparatively few accountants reach the pinnacle represented by the C. P. A. degree. It has been estimated that there are 250,000 private accountants in the field, and that as many students are now taking up bookkeeping as there are bookkeepers at present employed. Competition is stiff, but the young man whose interests are strongly commercial—who aims to enter the alluring

field of "business," which covers everything from the corner grocery store to the international corporation—there is no more promising stepping stone, or no more profitable end in itself, than accounting.

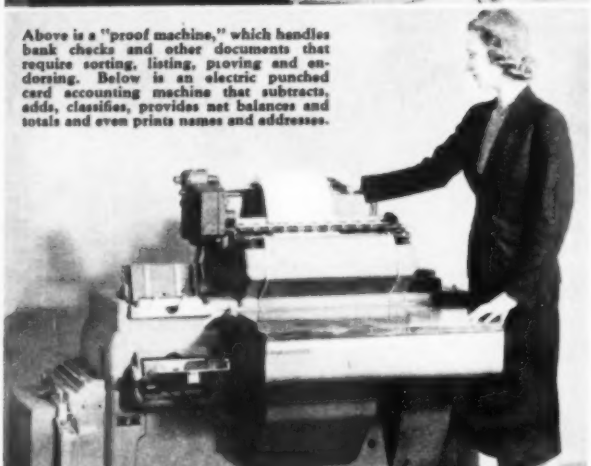
You will almost certainly be aware of it if you have business leanings, but several of the questions in the MECHANIX ILLUSTRATED aptitude test on page 71 will help you confirm it. Do you read the financial sections of your newspaper and understand the accounting terms you find there? Have you had a hand in the family budget or worked out a personal one to cover the expenditure of your allowance or weekly income? Do you have a pretty fair idea of what an office worker really *does* aside from wearing a white collar? Have you done such simple bits of accounting as maintaining a checking account and reconciling bank statements? Perhaps you have even emulated Rockefeller and started an account book of your own so you know just how you stand financially.

If so, you know that mathematical genius is not necessary in an accountant. He doesn't do lightning calculations in his head. Adding and calculating machines do much of that for him. He works with figures but his mathematical training need not extend beyond geometry, for the processes he uses are fairly simple.

It is convenient to divide the field into public accounting and private accounting, although the operations are similar. The public accountant is in business for himself or works for a firm that is. His skilled professional services are available to clients who employ him as they would a lawyer. The private accountant is on the payroll of a company and works for the firm just as any other employee—though he may know more about its operations than the president himself.

Usually it is the public accountant who is called in from the outside to audit a firm's books. He verifies records and statements, checks bills, payrolls and inventories and issues an auditor's report. He analyzes the condition of the business as the books show

The man who keeps the books often knows more about a firm than the boss himself. That's why he is an important and well paid worker.



Above is a "proof machine," which handles bank checks and other documents that require sorting, listing, proving and endorsing. Below is an electric punched card accounting machine that subtracts, adds, classifies, provides net balances and totals and even prints names and addresses.

Photos courtesy International Business Machines Corp.

it to be and advises executives of money-losing loopholes that need plugging. His certified statements are used by business in borrowing money from banks and in floating stock issues. The responsibility of the public accountant is, therefore, very heavy. He has no one but himself to "pass the buck" to and any attempt at bluffing is bound to boomerang and deal him a heavy blow.

The private accountant needs much the same background as the public accountant, but he is more likely to prefer group work and to be less of an individualist. The treasurer or controller of a company is a private accountant; large firms have departments which handle taxes, statements, audits and routine work of which a great deal falls under the head of simple bookkeeping.

Cost accounting is a vital branch of industry which is practically always handled by a firm's own accountants. His job is to find out exactly how much it costs to turn out certain products or do certain operations.

How much did your new automobile cost you—$1,000, perhaps? That figure wasn't arrived at by chance. Cost

Balance Sheet
For assaying the Accountant's Vocation

ASSETS	LIABILITIES
As key position, accounting is excellent route to promotion in business and brings contact with big executives	Personal responsibility very heavy
Income ranks equal with that of any other profession over a lifetime; good salaries come earlier in accounting than in most other vocations requiring comparable training	Must get special training; experience alone is not enough
Relatively easy for the well-trained man to get a job, since he offers specialized knowledge	Rush periods of first quarter of the year demand long, hard working hours
Field is constantly growing and will undoubtedly continue to grow	In general, demands wider range of aptitude than most other professions
Opportunities widely distributed	Intelligence requirements high; should rank with top 25% of population in intelligence
Not "old at forty"	Lack of personal qualities can hold back a man who has splendid technical abilities
Well adapted to spare time study, by correspondence, books, or local schools, while holding down a fulltime job	Extremely difficult tests must be passed for C. P. A. rating (though this is not essential for private employment)
Offers good chance to earn while learning	Much of work is routine, confining (not a liability unless you have strong "outdoor" leanings)
Accountant is highly respected, important, well-informed member of community	High school education or equivalent required
Many branches in which to specialize	
C. P. A. rating practically assures you of lifetime employment	

Test Your Qualifications for the Vocation of

ACCOUNTANT

Answer each question "Yes" or "No" by checking in the proper column.

	Yes	No
Do you have a high school education or equivalent?		
Can you perform ordinary mathematical processes (through geometry)?		
Do you read the business and financial sections of your newspaper?		
Are your interests strongly commercial—i. e., do you like "business," understand how its general operations are carried on?		
In your opinion, do you rank high in general intelligence—good marks in school, wide general information, hold your own with others?		
Can you learn readily by reading fact-crammed, "meaty" texts and books?		
Is your handwriting neat and legible?		
Are you naturally skeptical, "from Missouri," taking nothing for granted?		
Do you like to deal with abstract theories?		
Can you discipline yourself, utterly refusing to bluff or guess?		
Are your thinking and work habits accurate, thorough, and logical?		
Do you like detail and have capacity for storing countless facts in your memory?		
Do you have a pleasing personality, good personal appearance, manner and dignity that make a good impression?		
Are you able to express yourself well in grammatical English, with a good vocabulary?		
Do you get along well with people and have ability to influence them?		
Do you have the ability to say "no" when "yes" would be more comfortable?		
In your daily activities do you feel that you demonstrate sound judgment—your record is relatively free of careless "boners"?		
Do you welcome responsibility which may seriously affect the lives of others?		
Are you readily adaptable to changing conditions?		
Have you any business experience or contacts with men in the general business field?		
Do your friends generally credit you with making hard-headed decisions?		
Does office work and "book work" appeal to you strongly?		
Do you understand the meaning of such terms as balance sheet, liabilities, assets, discount, debenture, audit, accounts receivable, inventory, depreciation, liquid assets, in the bookkeeping sense?		
Are you willing to work your way up slowly through outside study while working at small salary to gather experience?		

To interpret your score, credit yourself with 4 points for each "Yes" answer. There is no credit for "No" answers. For satisfactory aptitude for the accountant's profession your score should be 80 or better. A lesser score may indicate that you are suited for bookkeeping or routine junior accounting positions.

accountants calculated very carefully just what it cost, in labor, overhead, and materials, to turn out the crankshaft, the flywheel, the hubcaps, and hundreds of other units that make up a complete car. They can even calculate to the last penny what it costs to put an extra gear tooth in next year's flywheel. Detail work? An infinite amount of it, but plenty of constructive thinking too.

Not long ago a salesman for a large Eastern paper mill complained bitterly: "I can write twenty times as many orders as the mill will let me accept! Publishers are fighting to place orders for a year's supply of paper, figuring that the war will send prices skyhigh, but the mill will only accept orders for a customer's normal requirements. We're losing thousands of dollars!"

Since the salesman wasn't an accountant, he did not know that the "thousands of dollars" could actually turn into staggering losses. Costly plant extensions and overtime labor are all very well at peak periods, but represent serious losses when production drops to normal. All over the country right now, in various heavy businesses that are booming, largely owing to military causes, cost accountants are holding back production men who are champing at the bit to grab all the orders in sight. In the slack periods which follow booms, those same accountants will advise executives on methods of retrenchment and cost cutting. Whatever the status of business, it is the hard-headed accountant whose unemotional advice usually carries the day.

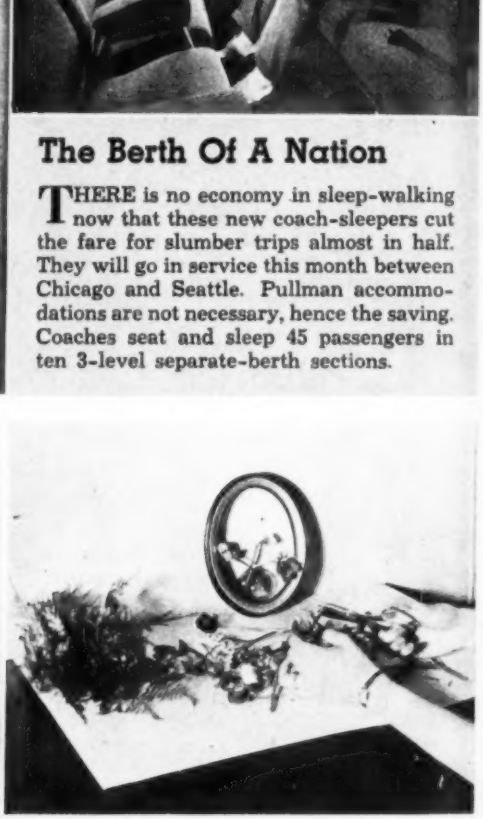
Walter S. Gifford, president of American Telephone and Telegraph Co., started his career as an accountant with Western Electric. He devised so many cost-cutting methods, based on his knowledge of accounting, that his company promoted him to office efficiency expert. Gifford's success attracted the attention of Theodore N. Vail, head of A. T. & T., and he hired the young accountant who later became the head of the country's largest corporation.

Tax accounting is another thriving specialty which has doubled the demand for trained men in the past few years. Government regulations have so increased, and will undoubtedly continue to increase, that even the smallest business needs the occasional services of experts. State and federal income taxes, corporation taxes, undivided profits taxes, social security taxes, unemployment taxes, franchise taxes, occupancy taxes, capital stock taxes, sales taxes—these far from exhaust the list. Tax experts are usually

[*Continued on page* 132]

The Berth Of A Nation

THERE is no economy in sleep-walking now that these new coach-sleepers cut the fare for slumber trips almost in half. They will go in service this month between Chicago and Seattle. Pullman accommodations are not necessary, hence the saving. Coaches seat and sleep 45 passengers in ten 3-level separate-berth sections.



Still Life—Life Still In It

A NOVEL picture frame containing a small vase permits flower lovers to "frame" their bouquets. There are two types of the new ornament, one for wall use and one for table use. To maintain the artistic value of the "still life" it is merely necessary to frequently water the "pictures" to keep them fresh and ornamental.

A New Aid For Paralytics

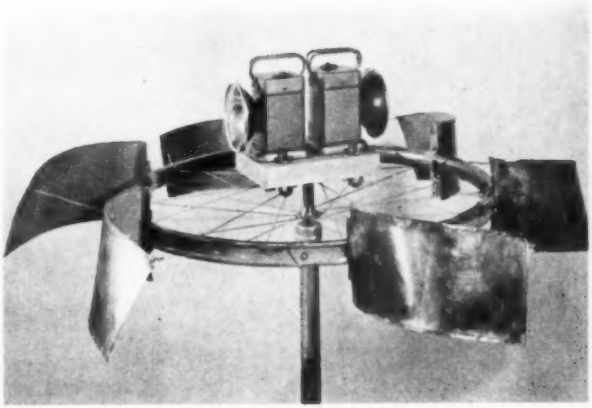
BETTY LOUISE MORRISON is smiling. The memory of the four years she was confined to her bed need haunt her no more. The little machine on the floor came to her aid only five months ago, but with its assistance, the battle back from the ravages of infantile paralysis is practically won. Invented by Joseph and Charlie Challette, the machine turns bicycle pedals at a rate of from one to twenty-six revolutions per minute. Through its use Betty Louise is now able to stand up and even take a few steps. One-eighth horsepower operates the device.

Shoot The Headlines To Me, Herbert

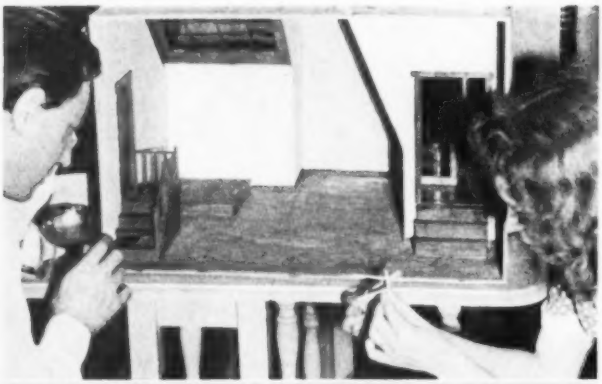
GUNS have been in the news for a long time. Now the news is in the guns. E. Y. Keith, district delivery manager of a Florida newspaper devised this delivery gun to save time and eliminate accidents in getting his papers from the truck to the customer. Now he needs only to drive serenely along the boulevard and shoot his enlightening ammunition into the paper-boxes.

Here's The Wheel The Ducks Duck

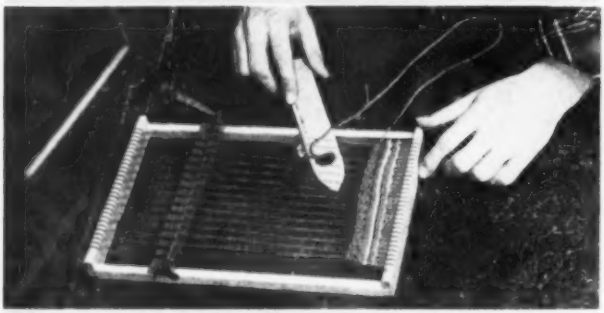
ABOUT an hour before dawn the ducks had a habit of landing in farmers' grain fields and holding banquets on the grain. Mr. F. M. Uhler and Mr. S. Creech designed this wind-driven duck scarer with its electric spotlights, to curb losses. The vanes are made from discarded oil cans and serve the dual purpose of harnessing the wind for rotation, and reflecting the light.



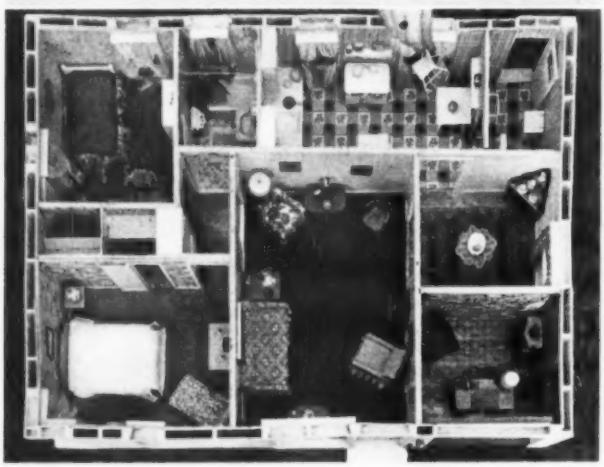
ORIGINALITY MAKES



Above: Finishing the details and furniture for a miniature artist-studio. Below: Weaving a tiny rug on a small hand loom. Attention to detail is vital to the achievement of realistic effect in this unique work.



Below: A modern cottage completely furnished. Note hand at top.



THE curtain draws, and you are looking at a tiny room of the Lilliputians, dating back to the Renaissance. To the rear is a large stained glass window, flanked by a crucifix on one side, and weapons on the other. There are draperies, a fireplace, tables, seats, rugs, a Bible, paintings—all clean and intact, as if the little people had just abandoned them.

But the little people won't return, for this room and many others like it were made by Mr. and Mrs. Forrest Barnes, two full sized human beings, living in Hollywood, California.

In spite of minute perfection, only the most simple tools are used—razor blades and nail files just about make up the entire kit. As for the materials, many are odd items, such as might be found in any attic, which are worked over to suit the situation, with the exception of the furniture, which is all fashioned of soft balsa wood.

Take for example the stained glass window. This is a sheet of transparent celluloid, on which the figures have been drawn free hand in ink, and the spaces between the lines are filled in with colored tissue paper.

In this same room is a brick fireplace. Actually, it is made of plaster of paris, with a sheet of balsa covering the outside. To make the balsa simulate bricks, it is pressed with a steel ruler, and carefully painted.

On the left wall is a coat of arms. The shield is pressed tinfoil, and the crossed weapons are hospital swabs, with tinfoil tipping.

Many of the rooms have beds. These are perfect in every detail, even down to mattresses, which are stuffed with cotton and paper.

A FIRM FOUNDATION!

Above: A complete reproduction of a Renaissance room. The one-foot ruler gives an idea of the size. Below: A candle looks like a log in this tiny fireplace. Every detail is scaled.

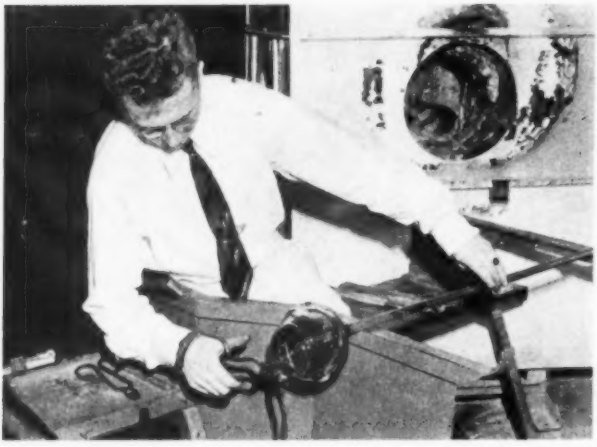
The problem of getting something to simulate pottery proved a problem. It was solved by manufacturing tiny pottery objects—dishes, vases, etc. The little daubs of potters clay are placed on a cardboard about the size of a soda cracker, and moulded with a hospital swab. Then they are painted with potter's underglaze, and baked in an oven at 1,800° F.

Some objects cannot be easily made, and are best imitated. Here possibilities are limited only by limits of the imagination. For instance, a crystal chandelier is a string of beads, carefully restrung. Candlesticks are glass buttons, with round glass beads for bases. Andirons are dress clips, inverted. Wall tapestries are gravure plates, taken from a magazine. In an old-fashioned bedroom, the traditional bed warming pan is the top of a catsup bottle, hammered down.

Obviously, for work of this kind, the most complex tool needed is plenty of originality. Fashioning the soft balsa wood is relatively simple; any nail file or emery board will serve as a miniature rasp. More difficult is joining the pieces. This is done with liquid cement, the most expensive item in construction. Expense is a small factor. The Barnes estimate that the rooms cost them only about $10 apiece.

"Ameripol" Rubber Made From Oil

DR. WALDO SEMON, discoverer of the new synthetic rubber, "Ameripol," displays a luscious looking blob of it before the eager eyes of some of the nation's leading industrialists and military experts. Like ordinary rubber, the new compound can be made into automobile tires and many other articles of military and civilian use. The new product is manufactured from a petroleum base.



The Glass Business Blow By Blow

DEFTLY clipping the edge from a newly blown goblet, this expert craftsman entertains the spectators at the million-dollar Glass Center of the New York World's Fair. The glass is heated, blown, and finished on the stage while the crowd looks on. Each process of manufacture is duplicated in the demonstration. The mouth of one of the furnaces can be seen in the right of the picture, behind the workman.

Crescendo From Cannon Console

AN INSTRUMENT of war is shown here as an instrument of orchestral value. Sgt. William Freeman mans the "console" of a 37 mm anti-tank gun to fire a blast during a recent concert presentation of the 1812 Overture. The use of the artillery necessitated supervision by a union musician, Charles Lemasch. Even though adjudged a musical instrument when put to concert use, it is doubtful that fieldpieces will become a regular part of symphony orchestras.

How to Build SECTION

Bonnie, the 18-ft. plywood auxiliary sloop we've promised you starts on page 82!

Safe Campfires For Every Purpose. When you go camping make that fire the right way. See page 98.

IN THIS ISSUE

Pictured here are a few of the selected projects you can build from plans and instructions given in the following pages. In addition, a section devoted to photography starts on page 78.

Folding Deck Chair for porch or lawn. Page 89.

Sportsman's Gun Cabinet. Every hunter should have one of these for his guns. Page 106.

Portable Picnic Outfit. Simple, sturdy picnic case and table that are amazingly compact when folded. Turn to page 94.

FUN WITH YOUR

There are plenty of opportunities for using the top shutter speeds of your lens, and chance for fun, too, by posing and shooting pictures like these. Left: "Blowing the Man Down." Below: "Knock-out Blow." Both pictures were taken with the action at its peak, thus reducing the required shutter speed.

by Louis Hochman

DO YOU have a camera with medium or high shutter speeds that you seldom use for lack of action scenes? Your top shutter speeds need not remain dormant, for you can have a great deal of fun staging your own action and thereby producing many novel pictures. This does not mean that you should hop, skip and jump for the sake of producing action. But if you can hop, skip and jump to produce an amusing effect, your reward will be a novel picture.

The action pictures illustrated on these pages are the result of careful timing, rather than high shutter speeds. The pictures were all taken at the "height" of the action. That's the moment when the jumper has lost all momentum in his upward jump and just before his downward descent begins.

"Walking on air," is a typical peak-of-action shot. To illustrate the idea, it was necessary for the subject to hop into the air and strike a walking pose before landing. The position of his hands and feet was carefully planned before executing the stunt, in order to achieve the desired effect. Even his expression was planned to give the impression of one casually strolling along in mid-air. To further heighten the effect, a comparison was provided by posing another model alongside, in a walking position, on

CAMERA AT 1/250

Above: "Walking On Air." Clever timing, rather than fast shutter speed, got this picture. Right: "Safe Landing," and "Bucking the Wind," below, are good stunts for high and medium speed cameras.

the ground. "The Knock-Out" is a picture of a wallop so powerful that it sent the opponent flying through space. It was easily posed without injury to the fighters. By having one at the receiving end of the uppercut leap high into the air and snap his head back, as the other swung his fist up past him, the effect of a terrific punch was obtained.

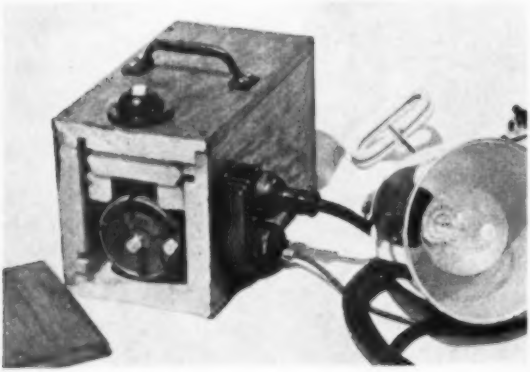
Where it is necessary for a model to jump and fall, injury should be avoided by selecting soft grassy or sandy spots for the poses. Here, the model's confidence in his ability to break his fall will enable him to assume a better pose in mid-air.

Although a 1/250-second shutter speed is quite sufficient for most action shots, faster speeds can be used. However, with cameras not possessing fast shutters, action can still be stopped at speeds as slow as 1/100-second, providing it is caught at its peak or at an angle to the camera. The easiest action to stop with a slow shutter speed is action coming head-on into the camera.

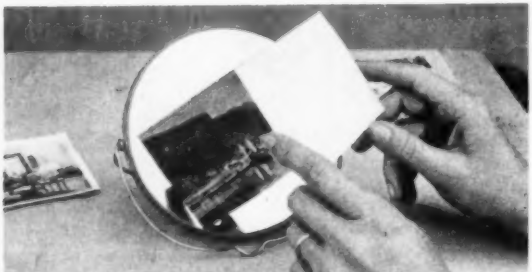
In pictures where the subject is supposed to be floating in the air, the effect can be

[*Continued on page* 143]

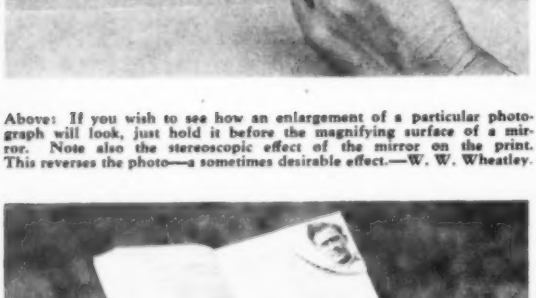
Kinks for Photo Fans



Above: This hand or foot-operated multiple flash device for open-and-shut shutter manipulation is made with a door bell cut into series with a 1½-volt battery. A three-way floor plug provides sufficient outlets for synchronized front, side and back lighting.—M. Knowlton.



Above: If you wish to see how an enlargement of a particular photograph will look, just hold it before the magnifying surface of a mirror. Note also the stereoscopic effect of the mirror on the print. This reverses the photo—a sometimes desirable effect.—W. W. Wheatley.



Below: The stopper, illustrated, serves as an excellent cork for large bottles. It fits snugly and is easily removed by yanking the chain or string attached to the ring.—Kenneth Murray.

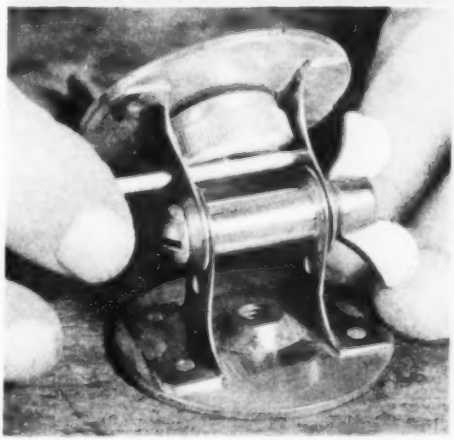
Below: If your enlarger is located near surfaces that reflect light, possible fogging of paper can be avoided by using a shield of black or dark cardboard around easel and enlarger.—K. Murray.

Above: This photographic bookmark slips over the corner of the page. It is cut in a semi-circle along one side. The top and right sides are folded and glued to form an "envelope."—H. Wallin.

HEAVY DUTY TILTING HEAD

Left: The heavy duty revolving head will handle anything from a miniature up. Above: Soldering ¼-in. nut to base to take tripod screw. Below: Note completed base on left. Window shade brackets form pivot arms for top and bottom parts of the head.

Below: The completed tilting head is easily operated. The small pin in the upper bracket prevents the thumb screw from falling out of the tilting head.



by M. W. Mutschler

THIS serviceable tilting top is made of four window shade holders (not slotted), one ¼x1½-in. round-head machine bolt with nut and wing nut, a 1-in. length of ¼-in. copper or brass tubing, two 2⅛x3/16-in. brass washers with ¼-in. holes, a 1⅛x⅛-in. pin for holding the thumb screw in position and a camera thumb screw. The assembly is simple and is graphically illustrated in the photographs.

Clean all parts to be soldered with steel wool. File the corners of the ¼-in. nut to make it of octagon shape. Screw this nut to one of the 2⅛-in. washers with the thumb screw, and solder around the nut, building up the solder until it reaches the level of the nut. Now remove the thumb screw and dress off the surplus solder. This is much more substantial than threading the washer itself.

Now ream out the bolt holes in the shade holders to ¼ in. Solder two of the shade holders to the side of the washer with the nut protruding. Line up the outside corners of the holders with the edge of the washer, with the two holders directly in line with one another, as illustrated. Now insert the ¼-in. tubing between the two brackets just soldered

[*Continued on page* 143]

BONNIE, 18-FT.

Designed and built especially for MI readers, this modern small auxiliary combines comfort with shallow draft, seaworthiness and good sailing.

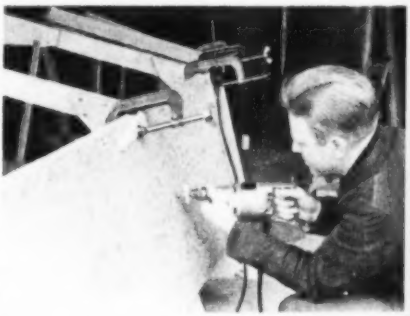
by Roland Cueva

FOR a long time the editors of MECHANIX ILLUSTRATED have wanted to place before its readers plans for a boat which would fit in with the ideas of those same readers—YOUR ideas, in fact. To do this, they made notations from the hundreds of letters received each month from boat enthusiasts and amateur builders, until, from the mass of data thus assembled, a conception of the ideal boat arose—a boat that would incorporate the greatest number of features appealing to the

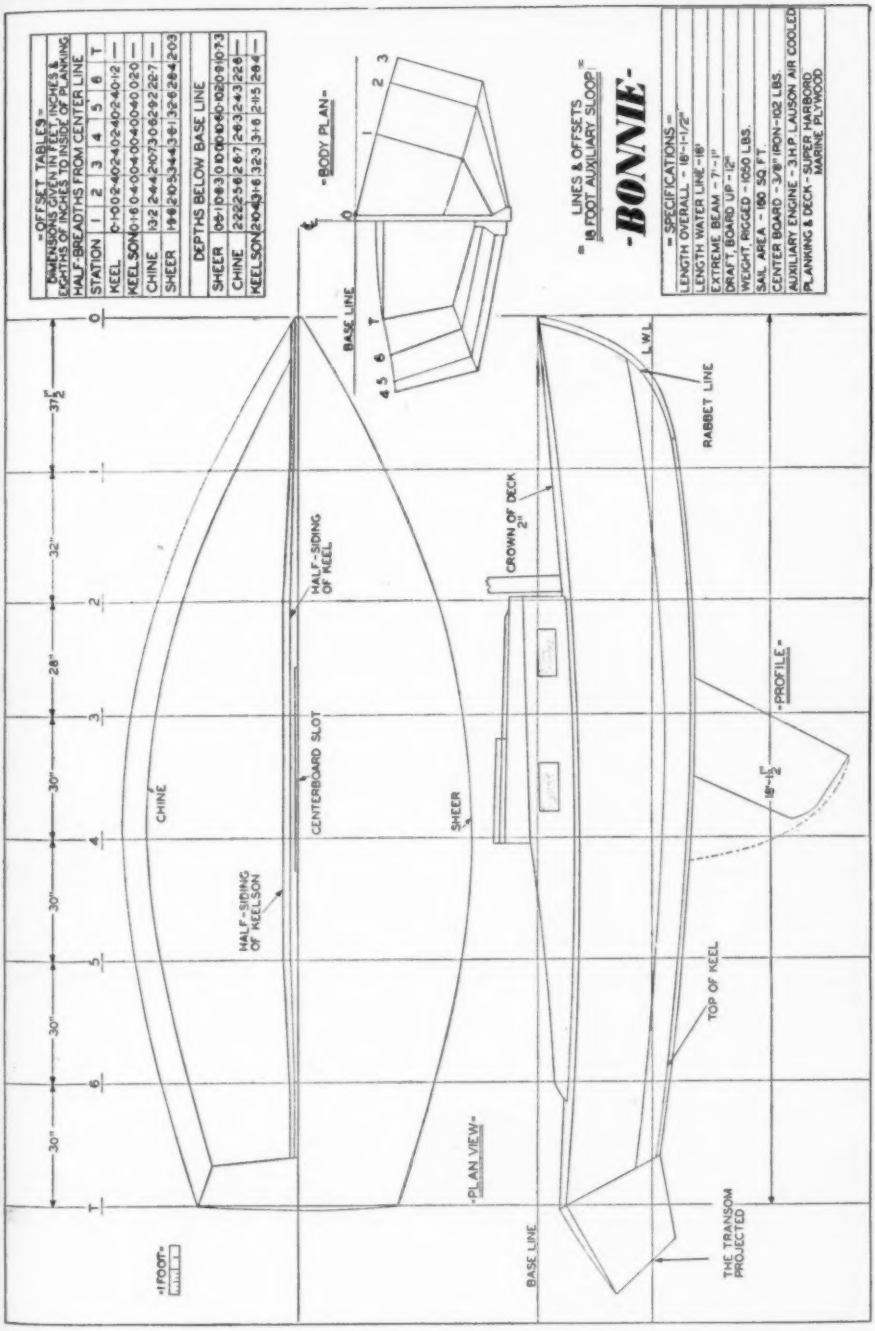
Right: Planking the side. Plywood makes the job quick and easy.

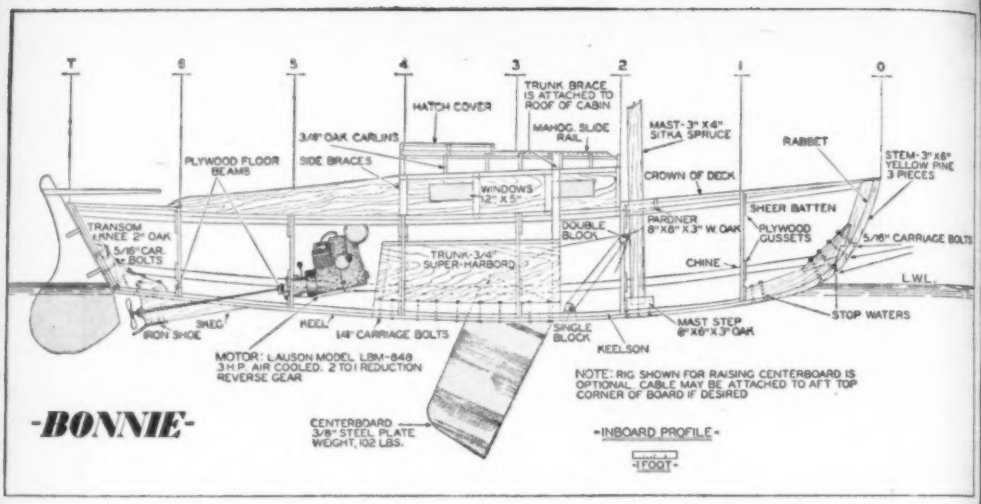
Left: Sides and half of bottom finished. The boat can be built in an average sized garage.

Below: The hull as it looks just after having been turned over.



PLYWOOD CABIN SLOOP

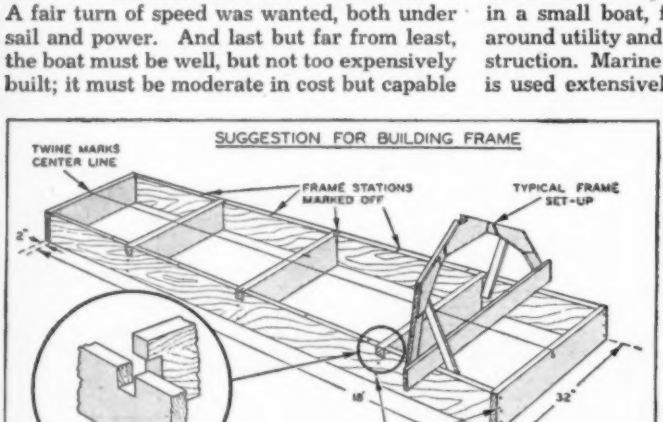

"OFFSET TABLES"
DIMENSIONS GIVEN IN FEET, INCHES & EIGHTHS. ALL MEASUREMENTS TAKEN
HALF BREADTHS FROM CENTER LINE
STATION 1 2 3 4 5 6 T
KEEL 0-10 2 4 0 2 4 0 2 4 0 2 4 0 1 2 —
KEELSON 0 1 6 0 4 0 0 4 0 0 4 0 0 4 0 0 2 0 —
CHINE 1 3 2 2 4 4 2 0 7 3 0 6 2 9 2 2 2 7 —
SHEER 1 9 9 2 0 5 3 4 4 3 + 1 3 2 6 2 6 4 2 0 3
DEPTHS BELOW BASE LINE
SHEER 0 5 + 1 0 8 3 0 10 0 0 0 6 0 4 0 10 2 0 9 10 7 3
CHINE 2 2 2 2 5 6 2 6 7 2 + 0 3 2 4 3 2 2 6 —
KEELSON 2 0 4 3 + 6 3 2 3 3 + 0 2 + 5 2 0 4 —
"BODY PLAN"
BASE LINE
"LINES & OFFSETS
18 FOOT AUXILIARY SLOOP"
"BONNIE"
"SPECIFICATIONS"
LENGTH OVERALL - 18'-11-1/2"
LENGTH WATER LINE - 16'
EXTREME BEAM - 7'-1"
DRAFT, BOARD UP - 12"
WEIGHT, RIGGED - 1050 LBS.
SAIL AREA - 150 SQ. FT.
CENTER BOARD - 3/8" IRON - 102 LBS.
AUXILIARY ENGINE - 3 H.P. LAUSON AIR COOLED
PLANKING & DECK - SUPER HARBORD MARINE PLYWOOD
"1 FOOT"
"PLAN VIEW"
HALF-SIDING OF KEELSON
CHINE
CENTERBOARD SLOT
HALF-SIDING OF KEEL
SHEER
BASE LINE
THE TRANSOM PROJECTED
TOP OF KEEL
CROWN OF DECK 2"
L.W.L.
RABBET LINE
"PROFILE"
18'-11-1/2"
0
1
2
3
4
5
6
T
30"
28"
32"
37-1/2"



Simplicity of construction shows in above profile. Headroom in the cabin is nearly four feet.

greatest number of people. Several things at once became obvious. The boat *must* have an engine. But a vast majority of the readers liked sailing, so the first problem was solved; the boat would have to have both sail and motor. Practically everyone preferred a boat of moderate size and ample beam; a roomy cockpit for fishing; a comfortable cabin for overnight trips. Shallow draft was desired, so that a dinghy would not be needed and the boat might even be beached, if necessary. V-bottom hulls topped the list because of their seaworthiness and ease of construction. A fair turn of speed was wanted, both under sail and power. And last but far from least, the boat must be well, but not too expensively built; it must be moderate in cost but capable of standing up under hard service and still have a good sale value. With these requirements in mind your boating editor got busy with pencils, paper and drawing battens. The result, after weeks of laying out and discarding various sets of lines, was the basic design of *Bonnie*. The details were then added, a model built, and numerous tests, including buoyancy tests, were made. When all had been deemed satisfactory, construction of the actual boat was started.

We think you will agree that *Bonnie* combines about everything anyone could wish for in a small boat, from beauty of line to all-around utility and sound, simple, modern construction. Marine plywood (Super-Harbord) is used extensively throughout, and because of it intermediate frames and seam battens are entirely eliminated, without any sacrifice of strength. The fairly deep V in the bow insures a hull that will not pound to any appreciable extent (all hulls have some sailing angle at which they will pound in a headsea) and the stern will lift easily to following waves. A small Lauson air-cooled marine engine of the latest type furnishes auxiliary power.

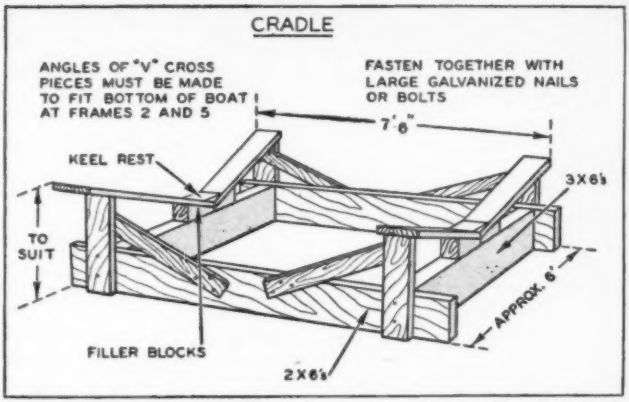


The building frame is made of inexpensive lumber and should not cost over $1.50. Be sure to check it carefully for level before erecting the boat's frames.

Laying Down The Lines

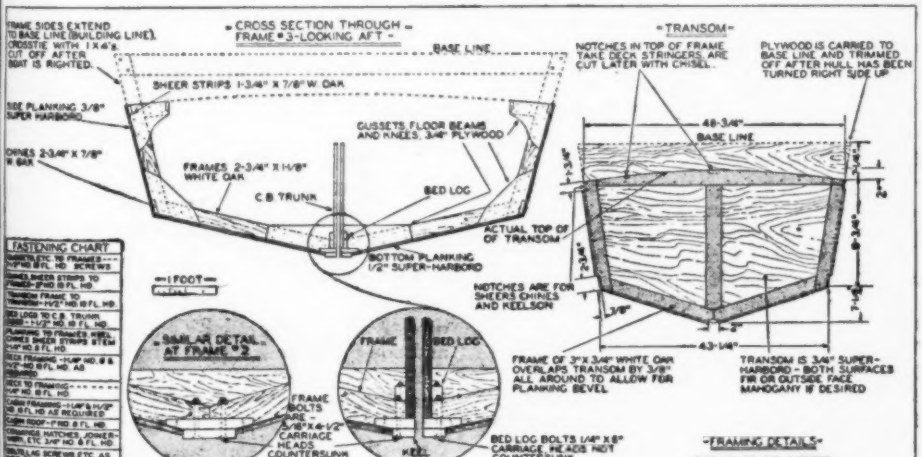
After ordering your

frame lumber and Super-Harbord according to the Bill of Material, obtain a roll of building paper from your nearest lumber yard. This paper comes in rolls 36-in. wide containing 500 square feet and costs about $1.20 per roll. One roll will more than cover your needs. It is to be used for making the full-sized lines and body plan drawings, and also for planking patterns later on. Some amateurs build their boats directly from blueprints and dimensions without bothering to make full-sized drawings, but this is a slipshod and inaccurate way of working, especially when the small amount of time and trouble consumed in laying out the lines actual size is more than saved in the consequent speeding up of work further along. If, however, you wish to avoid the necessity of making the full-sized plans, without danger of getting less than perfect results, MECHANIX ILLUSTRATED can supply full-sized patterns for gussets, stem, transom and knees as well as a full-sized blueprint of the body plan at moderate cost (see box at end of this article).

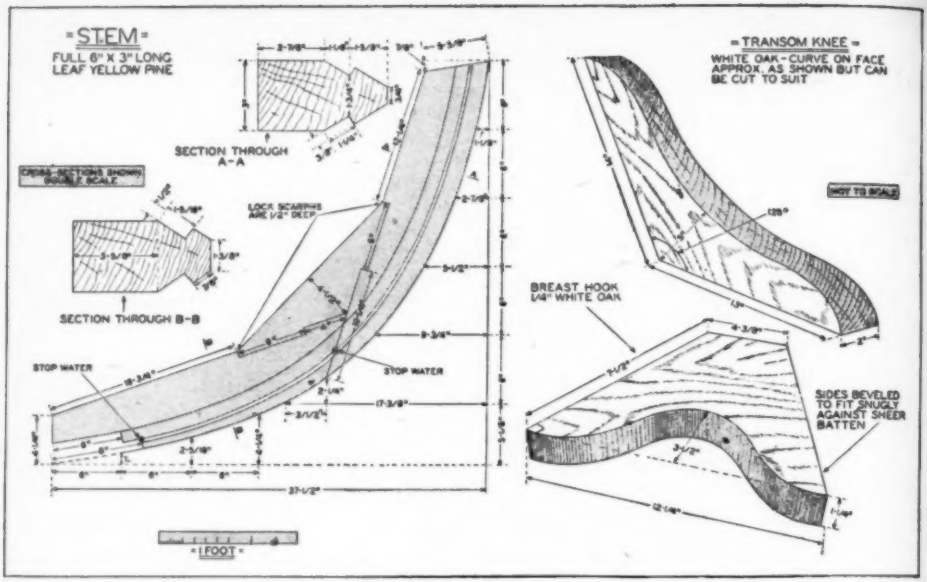


Don't build the cradle until you are ready to turn the hull over. The above sketch is merely a suggestion and can be varied to suit.

Assuming that you intend drawing the lines yourself, the first step is to cut three 20-foot pieces from the roll of paper, lay the pieces flat on the floor and paste them together with rubber cement or other adhesive. This will make one large sheet 20 by about 8½ feet. Paste up another sheet to a 5x8 foot size. Now spread out these big sheets on the floor and hold down the edges with books, thumb tacks or anything handy. With a chalked string snap down center lines and base lines, as shown in the plans. The lines are then transferred accurately to the larger of the two sheets—the body plan to the smaller. A long, straight rule, a couple of flexible battens and a black pencil will be needed for this. Measure off the frame stations along the center line and draw a line to indicate each one, at *exact* right angles to center and base lines. It then becomes a routine matter to draw the plan


FRAME SIDES EXTEND TO BASE LINE (BUILDING LINE). CROSSTIE WITH 1X4's CUT OFF AFTER BOAT IS RIGHTED.
"CROSS SECTION THROUGH FRAME #3-LOOKING AFT"
BASE LINE
SHEER STRIPS 1-3/4" X 7/8" W. OAK
SIDE PLANKING 3/8" SUPER HARBORD
CHINES 2-3/4" X 7/8" W. OAK
GUSSETS FLOOR BEAMS AND KNEES, 3/4" PLYWOOD
FRAMES, 2-3/4" X 1-1/8" WHITE OAK
C.B. TRUNK
BED LOG
ACTUAL TOP OF OF TRANSOM
BOTTOM PLANKING 1/2" SUPER-HARBORD
"TRANSOM"
NOTCHES IN TOP OF FRAME TAKE DECK STRINGERS, ARE CUT LATER WITH CHISEL.
PLYWOOD IS CARRIED TO BASE LINE AND TRIMMED OFF AFTER HULL HAS BEEN TURNED RIGHT SIDE UP
48-3/4"
BASE LINE
43-1/4"
NOTCHES ARE FOR SHEERS CHINES AND KEELSON
FRAME OF 3"X 3/4" WHITE OAK OVERLAPS TRANSOM BY 3/8" ALL AROUND TO ALLOW FOR PLANKING BEVEL
TRANSOM IS 3/4" SUPER-HARBORD - BOTH SURFACES FIR OR OUTSIDE FACE MAHOGANY IF DESIRED
FASTENING CHART
BRASS & BRONZE FASTENINGS ARE PREFERABLE FOR SALT WATER-GALVANIZED FOR FRESH WATER
1 FOOT
"SAILAR DETAIL AT FRAME #2"
FRAME
BED LOG
FRAME BOLTS ARE - 5/16"X 4-1/2" CARRIAGE HEADS COUNTERSUNK IN KEEL
KEEL
BED LOG BOLTS 1/4" X 8" CARRIAGE, HEADS NOT COUNTERSUNK
"FRAMING DETAILS"
"BONNIE"

The knees supporting the deck as well as those reinforcing the sheer strips at the transom are put in with the boat rightside up.



of the boat just as it will actually be, taking half-width and height measurements from the offset tables, spotting them on your drawing and connecting them up with pencil lines. It is, of course, only necessary to draw half of the boat in the plan view (from above).

Making The Frames, etc.

Having completed the full-size drawings (including stem and transom), you are now ready to retire to workshop or garage and cut the frames, gussets, keel, keelson, stem, transom and knees. You will note that the offsets were given to the *inside* of the planking, so there is no need to make allowance for the thickness of the latter, all frames being matched up right to the line on the body plan. Spread the body plan on the floor, with the base line at the top, take measurements of frame sides and bottoms as well as angle at keel and chine, and saw out the 24 frame pieces (4 pieces to each of the 6 frames) from 1⅛x2¾-in. white oak. If you have a circular saw this work can be done very rapidly as it is only necessary to set the mitre gage to the correct angles and then cut the pieces to their proper lengths, two at a time. Be sure to extend the side pieces clear up to the base-line. This causes the frames to automatically assume the correct shape of the bottom when they are placed upside down on the building frame. After the hull has been planked and turned over these extra lengths will be trimmed off at the sheer. As you finish cutting each frame place it on top of the body plan at its station for a final checkup. Incidentally, don't forget to mark the station number on each piece of each frame so there will be no mixup when assembling.

Next step is to cut the gussets (the angular pieces that tie the frames together) and floor beams from ¾-in. Super-Harbord marine plywood. The simplest and most accurate procedure, unless you have obtained the patterns, is to lay a large sheet of tracing paper over the body plan and trace off the angle at the chine and keel of each frame. Mark the outside line of each gusset 8-in. along the side and bottom of each frame, then at right angles across the thickness of the frame. A diagonal line from the two points thus established completes the shape of the gusset (see drawings and photos). Use the same procedure for the floor beams, allowing these to extend 14-in. or more along the frame bottoms. The outlines thus obtained may now be transferred by means of carbon paper directly to the plywood. Make two gussets and one floor beam for each frame.

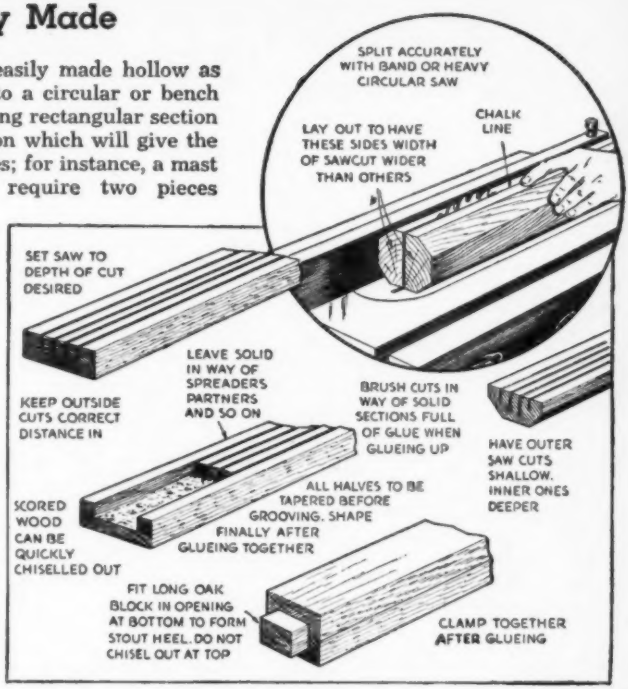
You are now ready to proceed with the frame assembly. Place the frame pieces, starting with No. 1, on the floor in their assembled position and coat the joints and places where gussets and floor beams will cover, with red lead. While the paint is wet

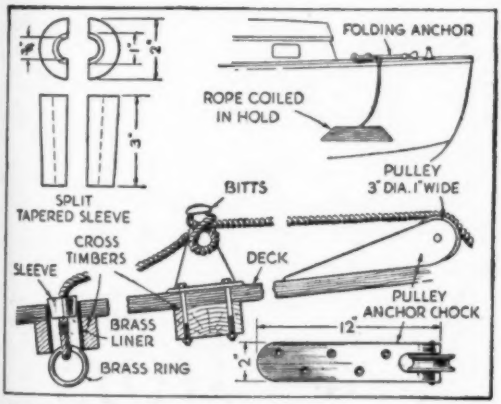
[*Continued on page* 115]

Hollow Spars Easily Made

MASTS and booms are as easily made hollow as solid if you have access to a circular or bench saw even of small size. In making rectangular section spars buy lumber of a dimension which will give the dimension required in two pieces; for instance, a mast to finish 3½x5½-in. would require two pieces 1¾x5½-in. If the full length is not easily obtainable, splices two-thirds of the way up one side, one-third up the other stagger the joints for strength. Set your saw to cut to a depth which will leave the thickness wall called for in your particular spar plan. Set the guide this same distance away from the saw and run each strip through to give say a ⅛-in. deep cut ⅞-in. from each edge. There will then be 3¾-in. between these at the lower part of the spar, less as it tapers toward the top. When both sides are

[*Continued on page* 140]


SPLIT ACCURATELY WITH BAND OR HEAVY CIRCULAR SAW
LAY OUT TO HAVE THESE SIDES WIDTH OF SAWCUT WIDER THAN OTHERS
CHALK LINE
SET SAW TO DEPTH OF CUT DESIRED
LEAVE SOLID IN WAY OF SPREADERS PARTNERS AND SO ON
KEEP OUTSIDE CUTS CORRECT DISTANCE IN
BRUSH CUTS IN WAY OF SOLID SECTIONS FULL OF GLUE WHEN GLUEING UP
HAVE OUTER SAW CUTS SHALLOW. INNER ONES DEEPER
SCORED WOOD CAN BE QUICKLY CHISELLED OUT
ALL HALVES TO BE TAPERED BEFORE GROOVING. SHAPE FINALLY AFTER GLUEING TOGETHER
FIT LONG OAK BLOCK IN OPENING AT BOTTOM TO FORM STOUT HEEL. DO NOT CHISEL OUT AT TOP
CLAMP TOGETHER AFTER GLUEING



Handy Anchor Cable

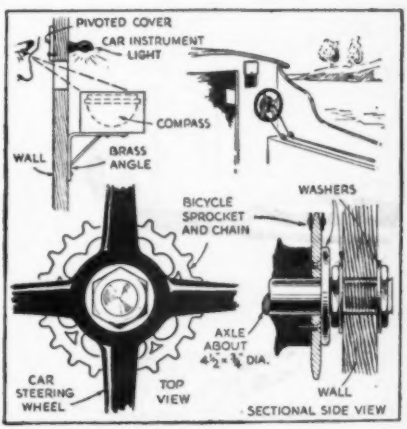
NOVA SCOTIA contributes this useful anchor cable arrangement. Foremost is the storing of the cable or rope in the forehold when not in use, rather than on deck, where it is usually tripped over at the wrong time. A heavy brass ring is fastened to the end of the

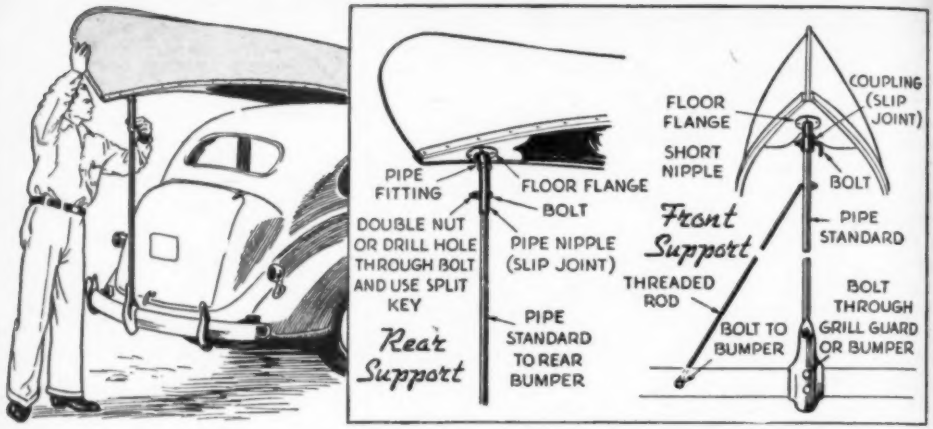
[*Continued on page* 141]

Aids To Blind Sailing

THIS compass is located near the wheel, on the aft wall of the cabin, inside, where it is viewed through a hole which has a swinging cover. A metal angle mounts the compass, over which is secured a small light.

A bicycle rear sprocket is fastened to a car steering wheel, and the whole mounted on a suitable shaft running through the cabin wall. Chain connects to the tiller ropes over the sprocket, giving a positive drive. —*B. M. I.*





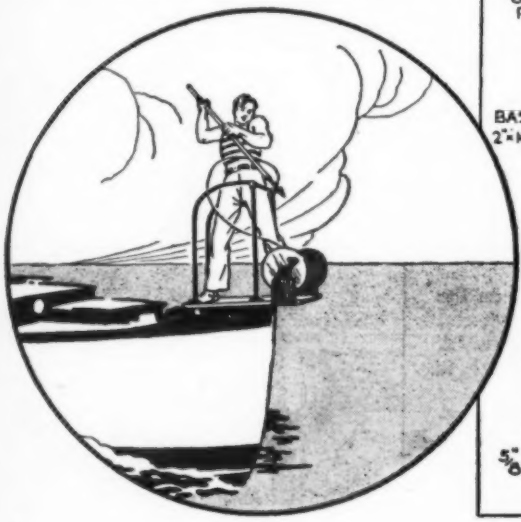
Simple Canoe Rack For Auto Use

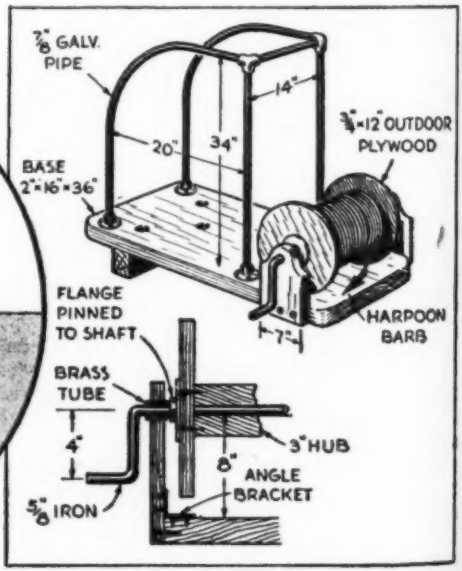
THIS carrier made from pipe fittings will anchor your canoe at front and rear, while sponge rubber pads, made for housewives to kneel on while scrubbing, cushion the car top and protect it from chafing.

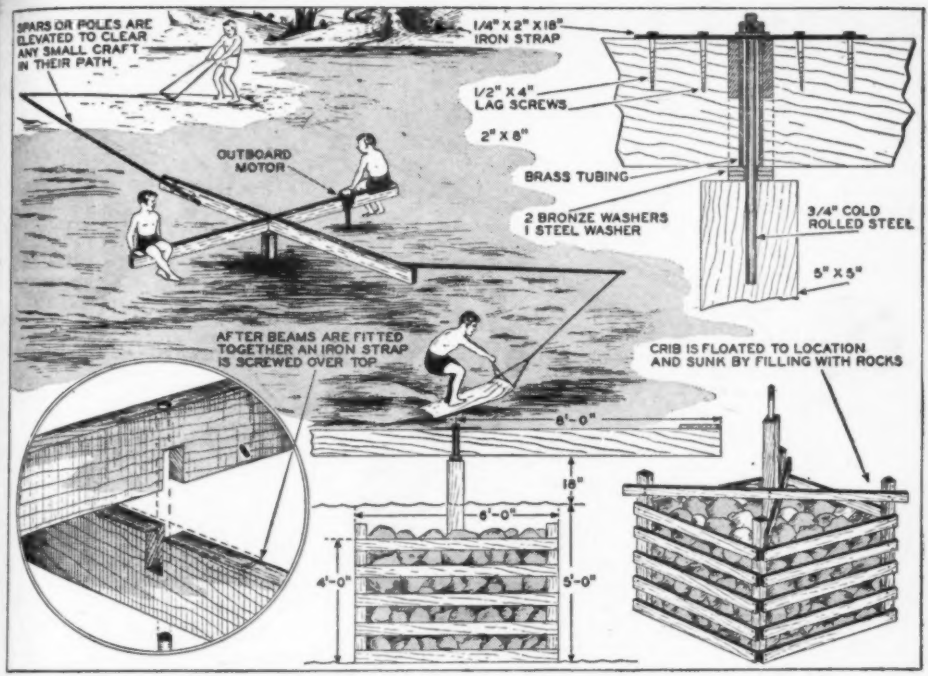
Two bolts attach the carrier to the car bumper. A short length of pipe attached to a floor flange anchored to the canoe frame, slips down over the carrier rod and is locked in place by bolts through holes in rod.—*S. G.*

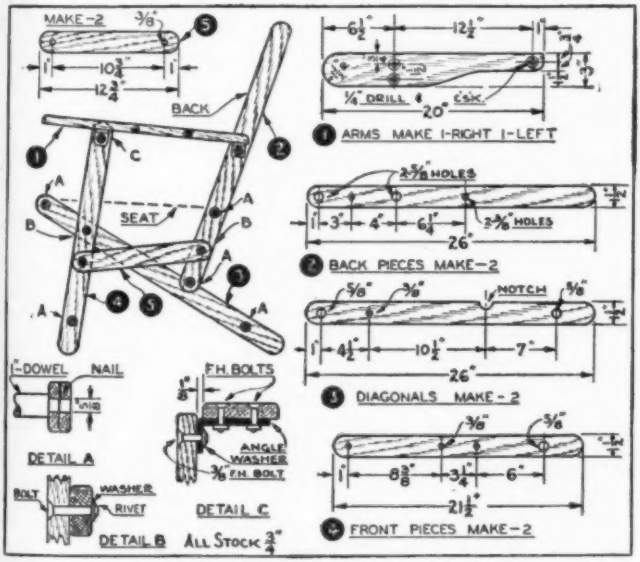
A Harpoon Pulpit From Pipe Fittings

HERE is an inexpensive and easily made harpoon pulpit which can be detached by removing three bolts and a couple of screws. The platform should be adapted to accommodate bow chocks and bitts. Guard rail is of galvanized pipe with fittings, and is secured to the platform with flanges. A simple reel is made of a wooden hub, and two outdoor plywood flanges turning on a bar iron axle, one end of which is bent to form the crank. Short lengths of bronze tube serve as bearings.—*H. S.*






SPARS OR POLES ARE ELEVATED TO CLEAR ANY SMALL CRAFT IN THEIR PATH
1/4" X 2" X 18" IRON STRAP
1/2" X 4" LAG SCREWS
2" X 8"
OUTBOARD MOTOR
BRASS TUBING
2 BRONZE WASHERS 1 STEEL WASHER
3/4" COLD ROLLED STEEL
5" X 5"
AFTER BEAMS ARE FITTED TOGETHER AN IRON STRAP IS SCREWED OVER TOP
CRIB IS FLOATED TO LOCATION AND SUNK BY FILLING WITH ROCKS
8'-0"
18"
6'-0"
4'-0"
5'-0"



A Nautical Merry-Go-Round

THIS amusement device can provide fun for small beach clubs or for the family at a private summer camp. Powered by an outboard motor, it can tow small boats or aquaplanes as well as carry passengers on its spars. It is wise, if the device is to be operated by one person, to include an automatic shut-off for the motor. Then if the operator tumbles into the water he can climb back aboard without waiting until the gas runs out.—*H. S.*

Folding Deck Chair

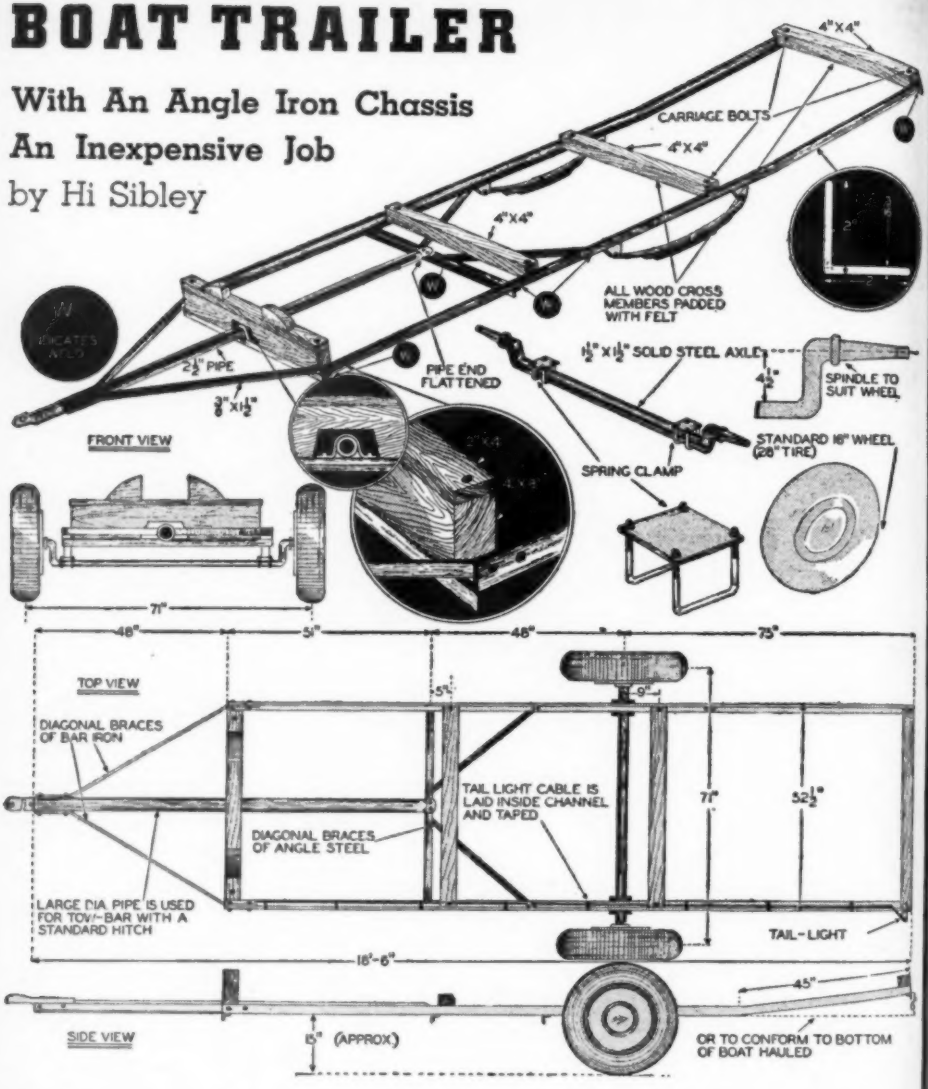
COMFORTABLE folding chairs are ideal for the lawn, porch or to take along on picnics or trips. Chairs of this type may be purchased very cheaply but they are usually not very substantial or lasting. The chair herein illustrated is not only a cool, comfortable folding chair but one that is husky in

[*Continued on page* 141]

BOAT TRAILER

With An Angle Iron Chassis An Inexpensive Job

by Hi Sibley



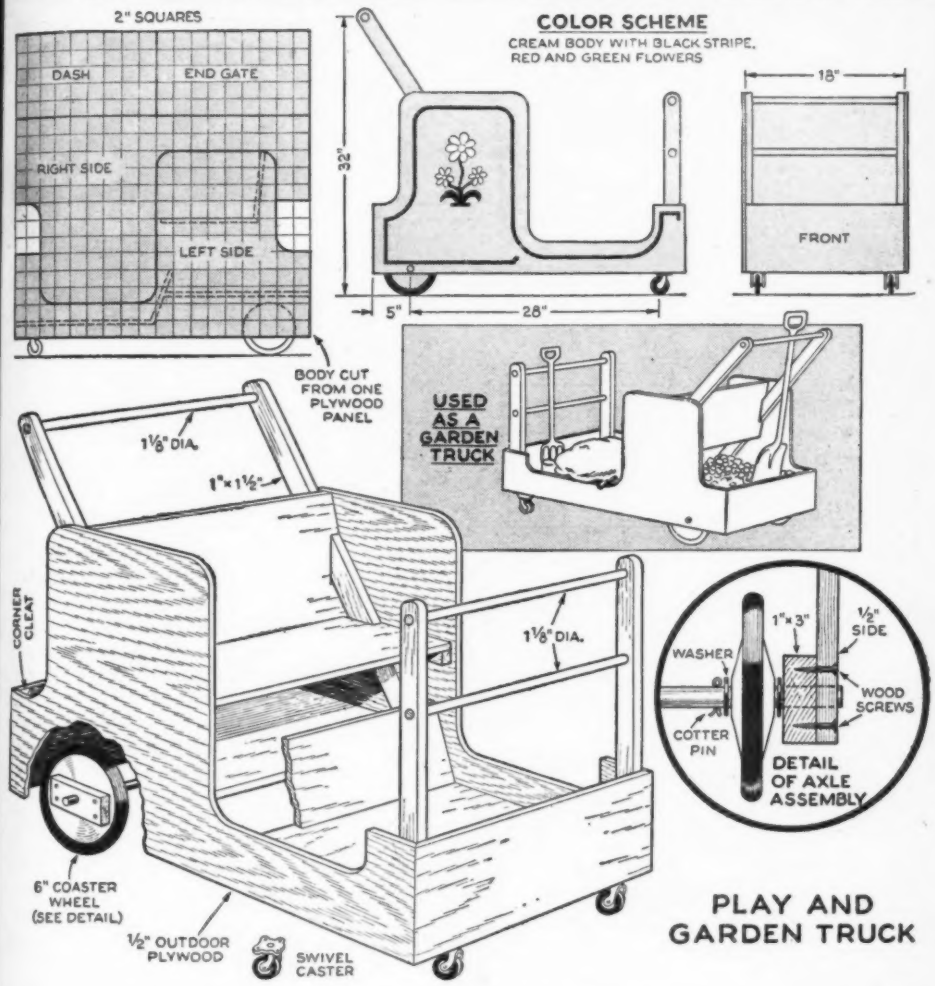
BOAT trailers are a long way from becoming standardized, but here is one that might well serve as a model. It is built of angle steel, bolted and welded together, with padded wood cross-members that give the boat a rigid and non-chafing bed. This bed may easily be adapted to fit any boat bottom. Standard 16″ automobile wheels are used, with 28″ tires.

The illustrations tell practically the entire story, but a few additional descriptions will help the prospective builder. Side members are of channel steel of substantial section ($\frac{3}{16}$″x2″x2″) with three cross-members of the same stock in addition to the axle and the wood beams. A large diameter pipe is used for tow-bar with a standard hitch, and diagonal braces of bar iron. Diagonal braces of angle steel just forward of the springs maintain the frame in line. Wood members are secured with carriage bolts and covered with half-inch felt.

A square-section solid steel axle is used,

[*Continued on page* 141]

The Gardener's Lawn Chariot



PLAY AND GARDEN TRUCK

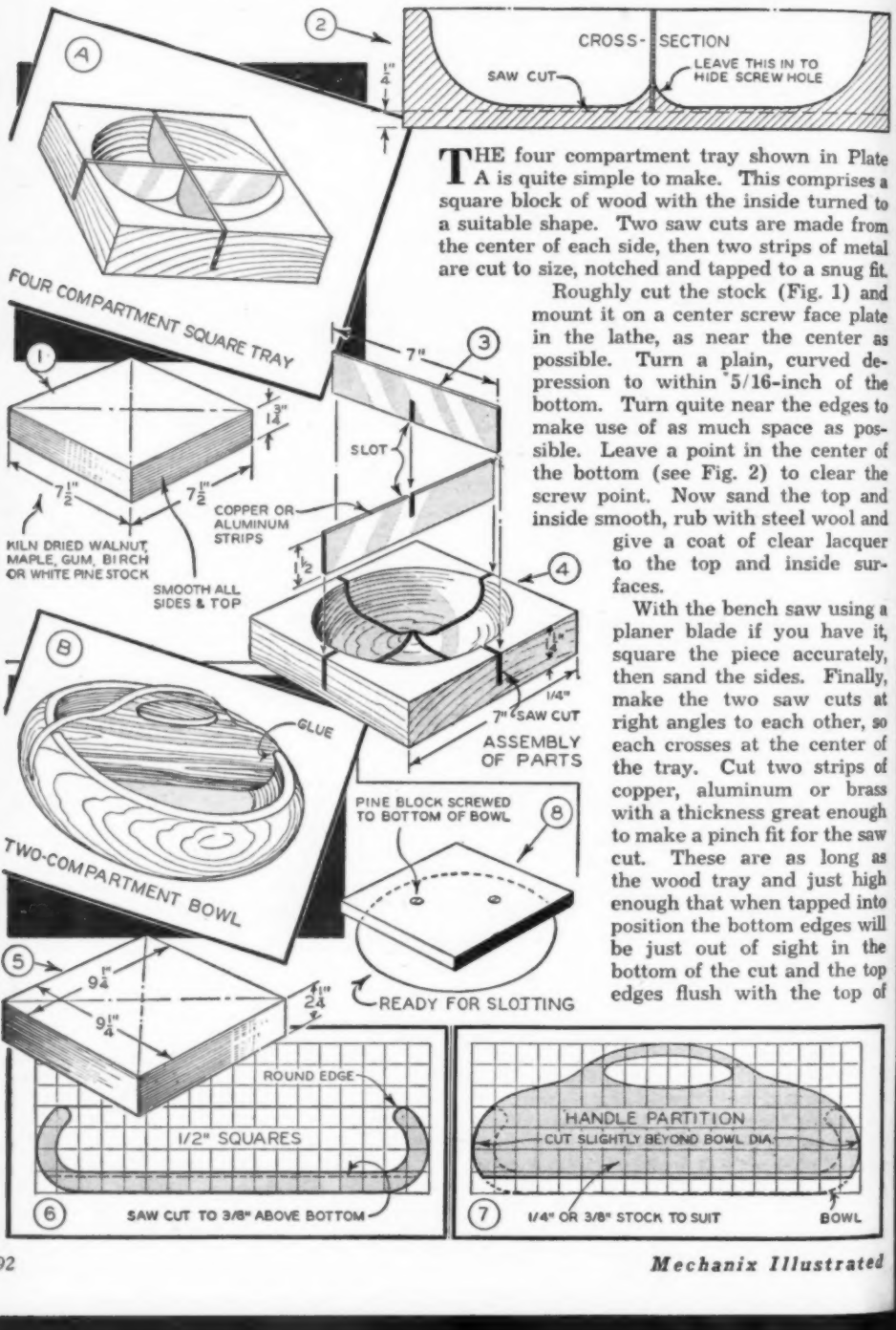
THIS handy truck serves both as a push-around cart for the children, and as a light truck to transport garden tools, hose, fertilizer, grass cuttings and raked leaves. Half-inch outdoor plywood is specified for the body, making a strong structure that will withstand any amount of sun, rain, sleet or snow and may be left outdoors all year.

By using the profiles in the squared drawing the entire body can be cut from a single panel of plywood 3 ft. by 3 ft. Ordinary disk coaster-wheels are used in back, with swivel casters, preferably rubber tired, in front. These should be of a fairly large diameter in order to run well on grass. Assembly is made with brass or galvanized screws and casein glue. A bright paint job will make an exceptionally attractive piece of garden equipment.

As the plywood is very light for its strength, the truck can be easily pushed about the yard by children. This provides them with an incentive to take part in the maintenance of the lawn.

The compartment under the seat can be equipped with a padlock and hinged panel, so that small garden tools can safely be left in it. This is of convenience when the tools would otherwise have to be kept in the cellar.—*H. S.*

Decorative Compartment



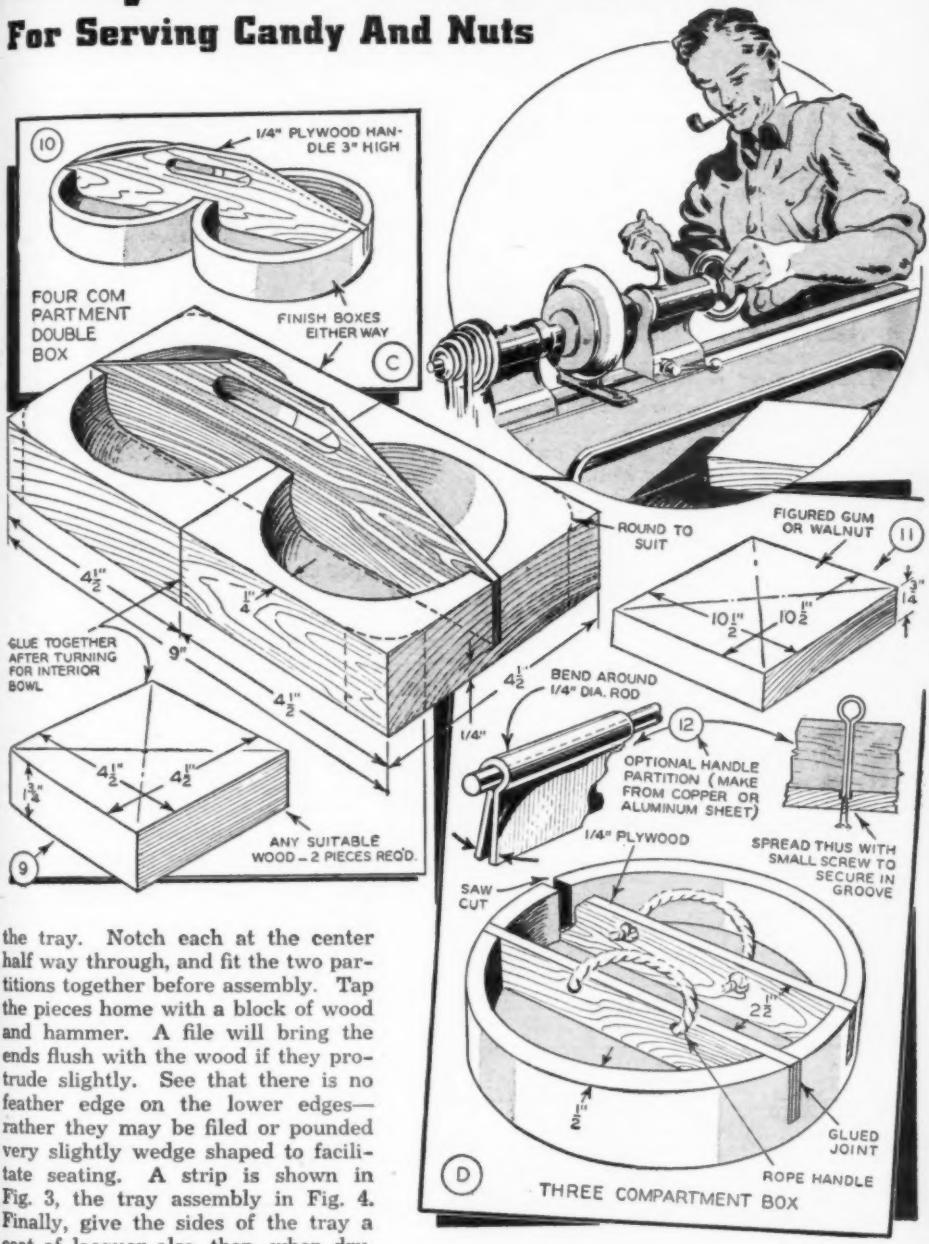
THE four compartment tray shown in Plate A is quite simple to make. This comprises a square block of wood with the inside turned to a suitable shape. Two saw cuts are made from the center of each side, then two strips of metal are cut to size, notched and tapped to a snug fit.

Roughly cut the stock (Fig. 1) and mount it on a center screw face plate in the lathe, as near the center as possible. Turn a plain, curved depression to within 5/16-inch of the bottom. Turn quite near the edges to make use of as much space as possible. Leave a point in the center of the bottom (see Fig. 2) to clear the screw point. Now sand the top and inside smooth, rub with steel wool and give a coat of clear lacquer to the top and inside surfaces.

With the bench saw using a planer blade if you have it, square the piece accurately, then sand the sides. Finally, make the two saw cuts at right angles to each other, so each crosses at the center of the tray. Cut two strips of copper, aluminum or brass with a thickness great enough to make a pinch fit for the saw cut. These are as long as the wood tray and just high enough that when tapped into position the bottom edges will be just out of sight in the bottom of the cut and the top edges flush with the top of

Trays For Lathe Workers

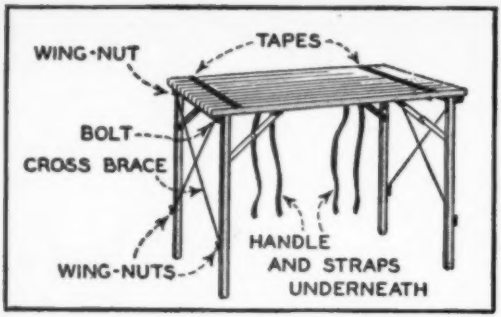
For Serving Candy And Nuts

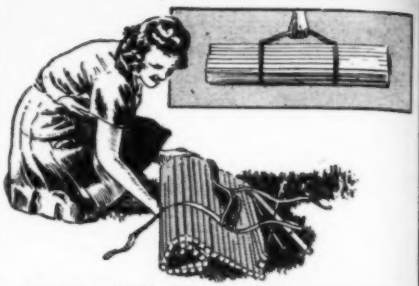


the tray. Notch each at the center half way through, and fit the two partitions together before assembly. Tap the pieces home with a block of wood and hammer. A file will bring the ends flush with the wood if they protrude slightly. See that there is no feather edge on the lower edges—rather they may be filed or pounded very slightly wedge shaped to facilitate seating. A strip is shown in Fig. 3, the tray assembly in Fig. 4. Finally, give the sides of the tray a coat of lacquer also, then, when dry, rub down with steel wool and wax. Felt should be glued to the bottom and the edges trimmed flush.

A two compartment bowl is shown in Plate

[*Continued on page* 138]





Compact and light, this picnic outfit can be set up or taken down in a jiffy.

Portable Picnic Outfit

HERE is your portable picnic furniture that spreads a table before you high and dry; at your elbow is a serving cupboard with all needful picnic accessories to be had without rummaging. Not only that, but it also contains the many things you always forgot to take when you had less than this providential case—items like matches, pepper, tinder to build fires in the wet, steak grill, toasting forks, etc. If you keep them there, they are always remembered, even in haste.

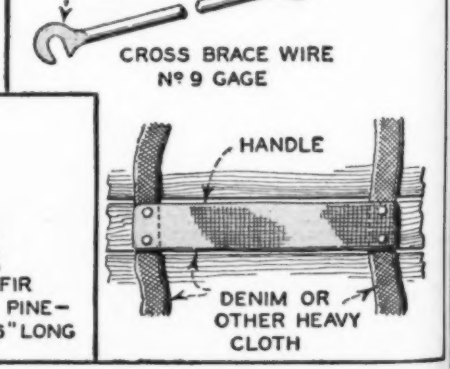
The table has much to commend itself to your fancy. It rolls up into a bundle 36″ long by 8″ in diameter; it boasts of a non-losable handle, and weighs just 12 pounds. Aside from a few items of hardware, it is made entirely of 1″x1″ fir or white pine—not a stick of any other dimension enters into its making. You can rip all the lumber from packing cases, and build it for a few cents.

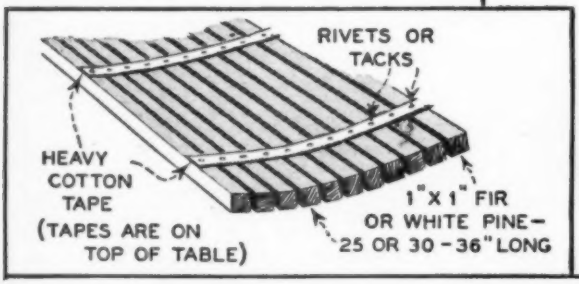
Do not let those humble facts mislead you, however. This table will blossom out into a full-sized 30″x36″ table that will stand without a wobble or creak, and for all its spindly appearance, will prove its capabilities by holding a 150-pound man.

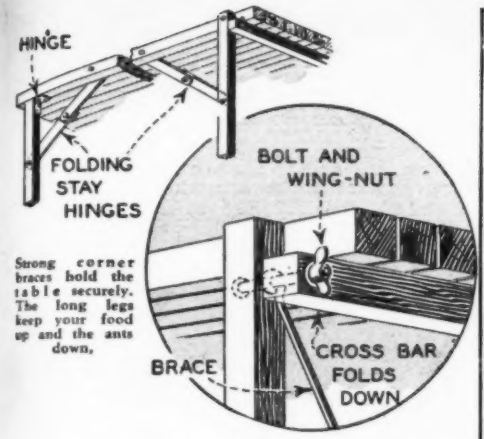
The construction of the table is made plain in the drawing. Note carefully how the legs are hinged to avoid interference in rolling the table. The tape is of heavy cotton of any suitable width. Delivery tape from printing presses or folding machines is suitable. It should be riveted on, but may be tacked if desired.

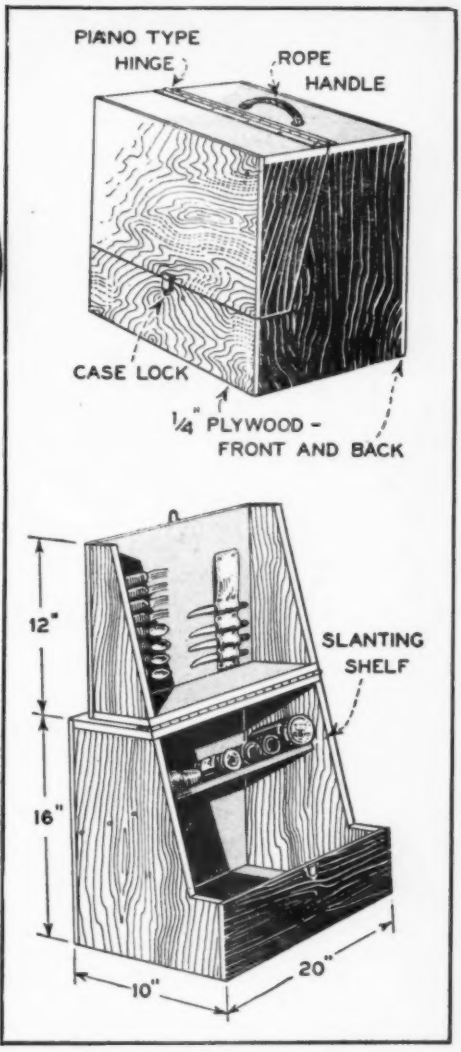
The scissors braces at each end are made of 9 gauge galvanized wire, flattened at the ends. One end is drilled slightly larger than the bolts and fastened as shown. The other end is drilled and slotted to fit under the wing nuts on the legs. Each leg is held in place by an elbow lid-stay. The tie-strings and handle are made of denim and tacked in place as illustrated.

In rolling it up, it is as docile as a cat if you proceed as follows: turn table upside down, and unhook ends of wire braces; remove cross-bars at one end, and collapse legs; then roll the table toward you, rolling *downward*. This detailed procedure is by






HINGE
FOLDING STAY HINGES
BOLT AND WING-NUT
Strong corner braces hold the table securely. The long legs keep your food up and the ants down.
BRACE
CROSS BAR FOLDS DOWN



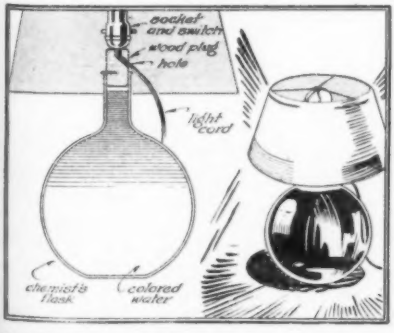
way of admonition—it will get as far out of control as a trust if you try less effective methods.

The picnic case is a kitchen and pantry in miniature. Three-ply wood should be used wherever possible to reduce weight. The dimensions given provide ample food and equipment space for four people, and will fit into the trunk of your car, along with four bridge chairs and the roll-up table.

Just to make the story right, the handle is a bundle of express cords tied at each end with a figure-eight knot on the under side of the holes. This will allow the lid to be opened wide.

The shelf is tilted toward the back to make a safe niche for the vacuum bottle and five small jars containing these items: oil-soaked sawdust for starting fires, matches, sugar, salt, pepper. A place may also be provided for a 1½ quart aluminum water pail.

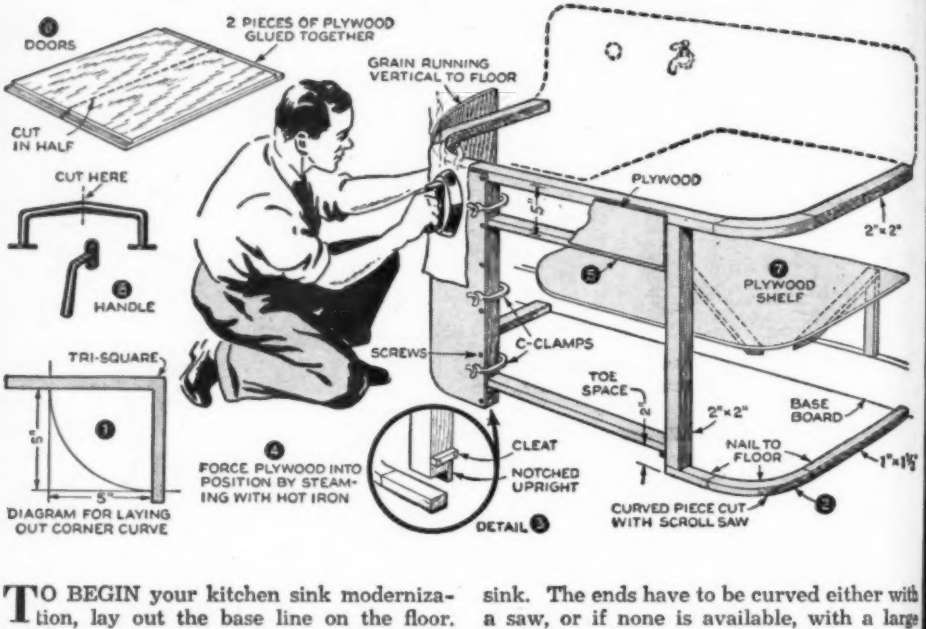
On the inside of the lid are two strips of denim tacked on to accommodate knives, forks, spoons, and toasting forks. At the lower edge of the lid is a handle.—*Fred Beard.*



Chemist's Flask Lamp Base

YOU can make an inexpensive copy of a blown glass lamp base from a chemist's glass flask, a switch socket and a whittled wood plug. Bore a hole in the top of the plug to take the socket, and another hole at an angle through which to run the light cord. Add dye of the desired color to water and fill the flask, fitting the plug and socket in the mouth of the flask as shown. Cut out a piece of imitation parchment paper, folding it in pleats and fastening the edges together with glue to form a shade. The upper edge of the shade can be glued over wire taken from an old lamp shade.—*G.E.V.H.*

MODERNIZING THE SINK



TO BEGIN your kitchen sink modernization, lay out the base line on the floor. Select a straight piece of wood, with the aid of a level, mark consecutive points on the floor, plumb with the inside edge of the sink. Now, join these points making a rectangle on the floor corresponding to the sink except at the corners. To obtain the exact curve, take a trisquare, place it on the corner of the sink. Measure from the corner of the square to the point where the curve of the sink starts to break away: In this case, it is five inches. Now, mark these two five-inch points on the floor; then, inverting the square, place it so that the two inside edges are on the five-inch marks; the corner of the square is the point from which to swing the arc for the curve. (See Fig. 1.)

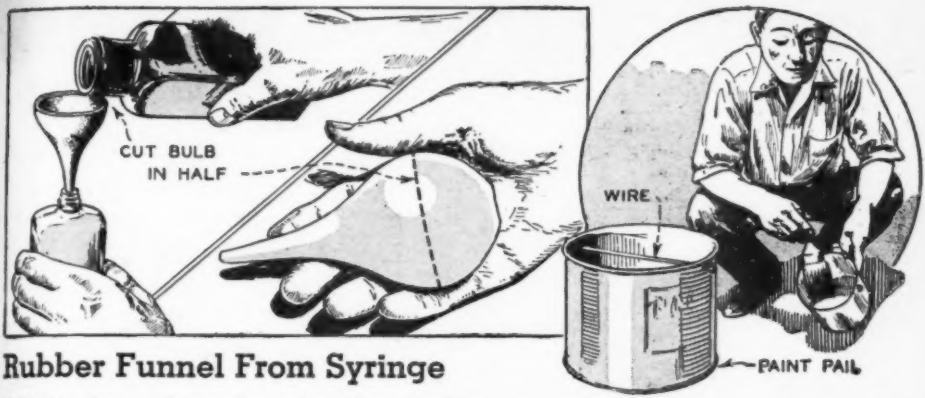
In laying out the base, use rough 1" x 1½" stock. In nailing, use six penny box nails and fasten securely as there will be quite a strain when the plywood is bent. The same proceedure is repeated on both sides. In laying out the curve, a scroll saw will give the best results but a satisfactory job can be had by nailing small blocks next to each other to conform to the line of the curve. (See Fig. 2.)

The top of the sink is made in much the same manner except that two inch stock is used. This fits snugly into the roll of the sink. The ends have to be curved either with a saw, or if none is available, with a large wood rasp. The sides are cut with the aid of a rasp and form the rest of the curve.

Two uprights are placed in front; rip a 2"x 4" piece 35" long. Place the resulting 2" square stock with the ripped side to the front. The ends are notched to fit behind the base line and the upper roll of the sink. These are then nailed in place at the edge of the base in front. The toe-space is constructed by nailing a small cleat, 2" long, to each upright, 2" from the floor. On the two cleats, a piece of finished 1"x2" material is nailed. This serves as the top of the toe-space and the bottom door frame. Behind, nail a strip of plywood to keep out dust.

The plywood is now cut. Be sure to cut it with the grain running vertical to the floor otherwise it will be impossible to bend it without cracking. To bend, begin by fastening in front with wood screws. Use three C clamps and a strip of scrap to hold it in place while bending. Wet the outside of the wood only. Then with the aid of a hot flat iron and a cloth, iron it much in the same manner as pressing clothes forcing it into position at the same time. The steam and the heat allow the wood to be bent. Continue bending slowly

[*Continued on page* 139]



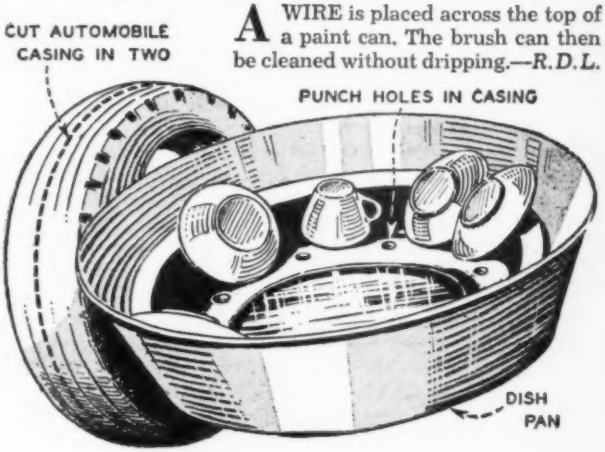
Rubber Funnel From Syringe

THE amateur chemical experimenter often has use for small funnels in the course of an experiment. Funnels of the desired size often cost more than large ones. Also, frequently a funnel is needed for some purpose unsuited to metal, such as acid handling.

In instances of that sort an old rubber syringe can easily be made into a very efficient funnel. The bulb is cut in half with a knife or scissors to form the bowl of the funnel. If the hole in the end of the syringe is not large enough for the purpose in mind, it is a simple matter to cut off a portion of it. The hole will then be proportionally larger. In this manner funnel can be adapted to work.

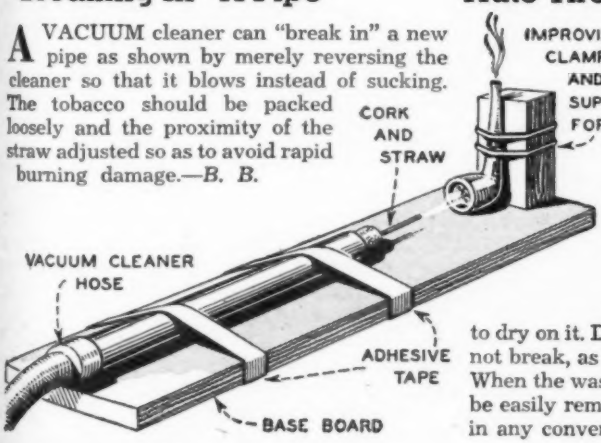
Cleaning Paint Brushes

A WIRE is placed across the top of a paint can. The brush can then be cleaned without dripping.—*R. D. L.*



"Breaking In" A Pipe

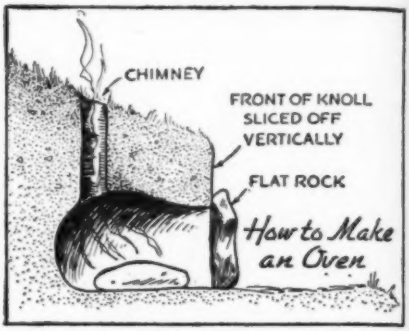
A VACUUM cleaner can "break in" a new pipe as shown by merely reversing the cleaner so that it blows instead of sucking. The tobacco should be packed loosely and the proximity of the straw adjusted so as to avoid rapid burning damage.—*B. B.*



Auto Tire Dish Drainer

HALF of a small auto tire casing, slit along the circumference as illustrated, makes a handy drainer to fit into the ordinary type of round dishpan. Holes are drilled through the sides of the casing as shown to aid in draining. The dishes can be washed through the center of the tire casing and then set to dry on it. Dishes dropped on the casing will not break, as the rubber cushions the impact. When the washing is through, the drainer can be easily removed from the pan and hung up in any convenient place.—*A. H. W.*

SAFE CAMPFIRES FOR EVERY PURPOSE

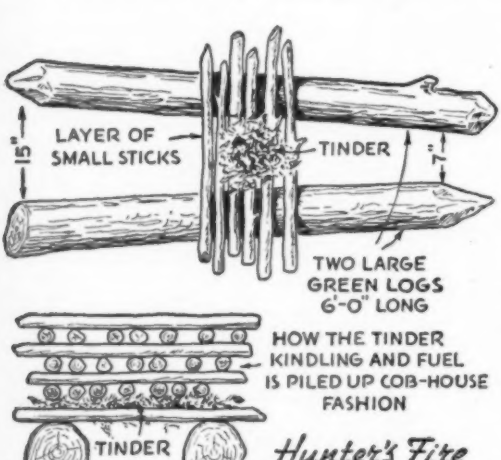


How to Make an Oven

CAMPFIRES must be adapted to either summer or winter and must be methodically built. Method implies a combination of applied science and an inherited procedure.

Campfires are divided into three groups. The hunter's fire, the trapper's fire, and the Indian's fire.

The hunter's fire gives quick heat and an all night fire when the weather is favorable. It consists of two green logs about six feet long laid parallel about fifteen inches apart at one end and half that distance apart at the other. A row of small sticks is then laid across them at the middle and tinder placed on top. Then a heavier, green stick is put at each end of the tinder and dry sitcks laid over them, parallel to the logs. This forms a sort of cob-house. Light the tinder and when the upper sticks burn through they will drop to the ground between the logs and set the dried, inner sides of the latter to blazing. If fresh fuel is piled on before turning in, a nice bed of hot coals will be found in the morning upon which a breakfast fire can be built.

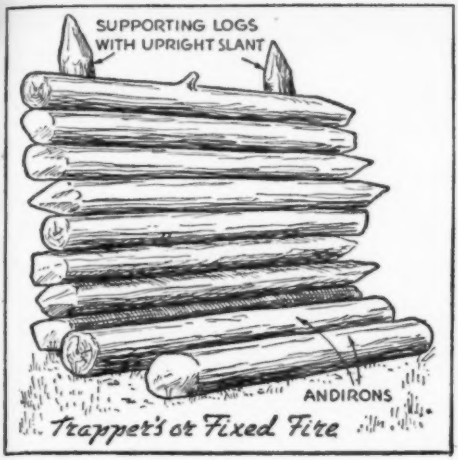


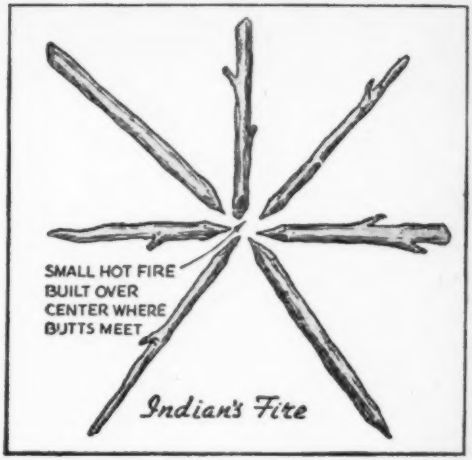
Hunter's Fire

A trapper's fire is intended for more or less a fixed fire in stormy weather planned to heat inside the shelter. Build it in front of a large boulder or other fire-wall in front of the shelter. If rocks are scarce pile up green logs in wall formation as a reflector. Two logs can then be arranged in front for andirons. Plaster mud or clay over and between the logs and around any part liable to attack by fire. Build the fire in the usual manner on the andirons. The heat is reflected back to the shelter and the back-wall acts as a wind-break.

Use the Indian fire for a one night stand. Cut hard wood saplings and lay several on the ground, butts meeting like wheel spokes. Build a small hot twig fire in the center and place the butts of other saplings on this, also spoke fashion. As this fire burns down shove the butts inward, always forming the wheel idea. With plenty of fuel and two or three replenishings a hot fire can be maintained all night.

Of course any good fire can be used for cooking but one to suit that purpose can be made as follows. Use two green logs as before but about three inches apart at one end and ten inches at the other. Flatten the tops and inside faces





with the axe. Drive a stake, forked at one end, at each end of the logs. Lay a green pole across these forks and hang the kettles by kettle-hooks as shown.

A good, natural oven can be fashioned by slicing off the side of a steep banking or knoll. Drive a four inch pole down vertically three feet back from the slice and withdraw carefully. This forms the chimney. Dig out the bank horizontally, commencing at the face so a cave is formed with the chimney at the rear. Dry out the interior with a small, slow fire and use a flat rock for the door. When ready to bake build up a hot fire of green sticks and allow to burn a couple of hours or so. Then rake out the embers and place the dough on green leaves or on the hot floor and close the door with the stone.

Tinder is the foundation of any fire. It must ignite easily and give a quick flame. In the woods there is dead wood from trees and stumps, toadstools, dry moss, puff-balls and willow catkins, dried dung, dry grass and leaves. There will probably be other suitable material native to your particular locality.

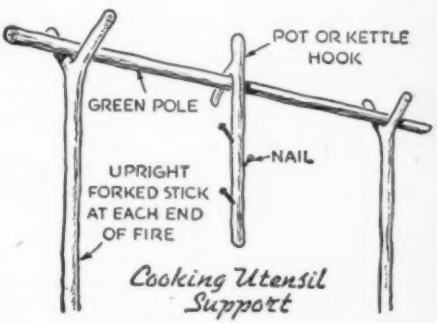
For kindlings use large pieces of dead wood, shavings, bark, pine knots, wood chips, dry willow twigs or even rags soaked in grease or tallow. Most dry wood will burn but choose the wood that ignites the quickest and easiest. Divide your kindlings into the soft woods and hard woods, the latter to be used for the more lasting and hotter fires.

Now for a general campfire lay two green sticks on the ground as a foundation. Lay a course of dry kindlings across these and place the tinder on them. Cob-house the rest of the kindlings, increasing the size as the pile rises. The rule—bed-logs, kindlings, tinder, kindlings, the regular fire-wood.

During stormy weather some sort of windbreak will aid in preventing embers or burning sticks from blowing away and it will reflect the heat where wanted.

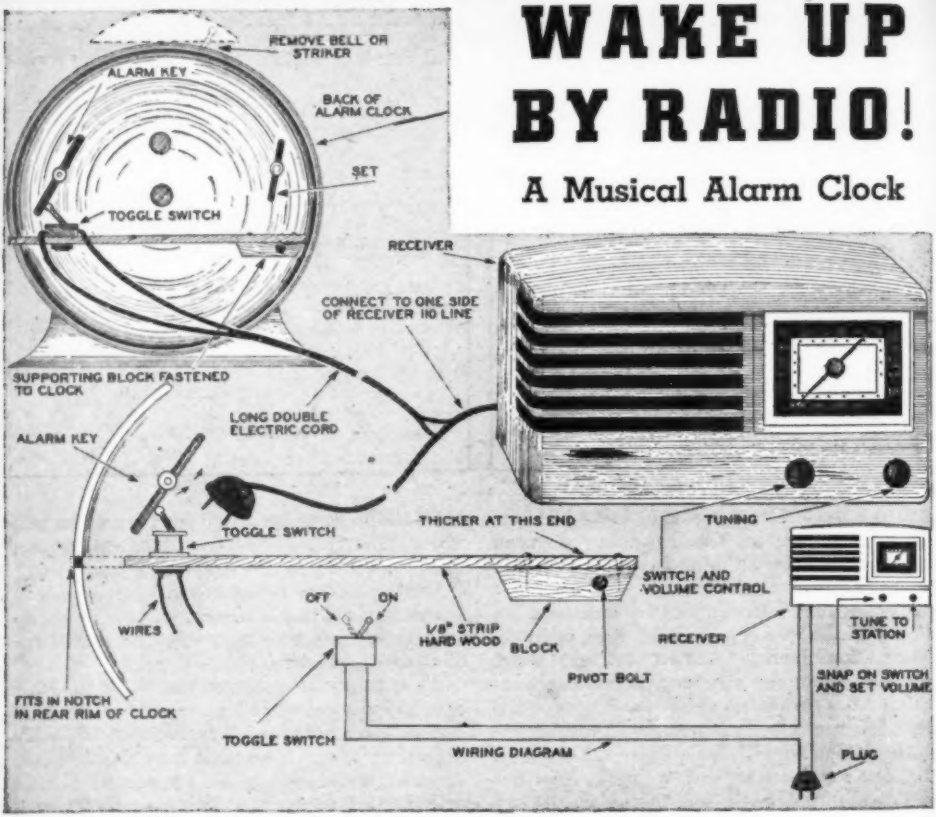
If matches are scarce kindle by striking sparks from pieces of flint, quartz or steel. If sunny, use a binocular lens, focusing the sun's rays on tinder. A suitable lens can be made from a flat piece of ice held between the hands and melted to form a lens shape. Even a watch crystal filled with water can be utilized as an improvised lens.

Always trench a fire when leaving it to prevent it from spreading. Don't take chances. A fire is a fire. Make it properly but *be sure it is out* before leaving it deserted. And if you smoke, throw your butts or ashes into the fire. Never toss them carelessly aside, where they may start a forest fire.—*L. B. Robbins.*



WAKE UP BY RADIO!

A Musical Alarm Clock



NOBODY loves an alarm clock. But waking up by music is different. Here is the way to arrange it and make the forced awakening much more pleasant.

Remove the alarm bell or striker from the alarm clock so no signal will be heard. Next, get an ordinary single pole double throw toggle switch from an old radio or from a supply store. Try a few until you find one in which the throw from side to side is positive but quite *easy* to accomplish with but little pressure.

Mount it as shown, on a strip of ⅛-in. hard wood with a thicker portion at one end. Pivot the heavy section to the back face of the clock so it rests horizontally with the toggle just in contact with the alarm winding key. A notch in the clock rim at the key end holds the strip firmly in position.

Connect the two terminals of this switch to a sufficiently long, double electric cord so the clock can be removed from the sleeper's hearing if desired. Then cut *one* wire of the plug-in cord on the radio and solder and tape the two ends of the clock cord to the severed radio cord ends as indicated.

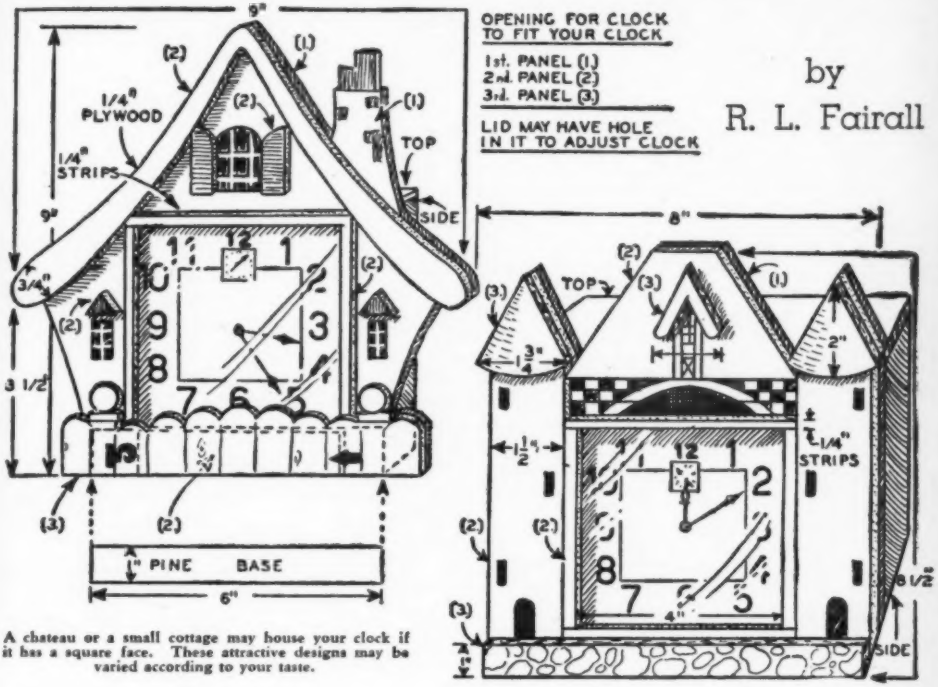
During daylight hours the clock switch can be thrown to "ON." Then when the radio switch is switched on it will operate the radio normally. At night, wind the alarm and set the clock switch to "OFF" and allow the end of the winding key to bear lightly against it. Set the radio on a station that comes on at the desired hour in the morning, and allow plenty of volume. The alarm, should of course, be set to go off at the proper time.

In the morning, when the alarm trips, the winding key will unwind and throw the toggle to the "ON" side. This completes the circuit from the wall plug to the radio. In a few moments the radio will operate loudly enough to waken the sleeper. Isn't that much better than the old rattly-bang alarm bell?

Wind the alarm key by springing the switch bracket out of its notch and push it clear of the key.—*L. B. Robbins.*

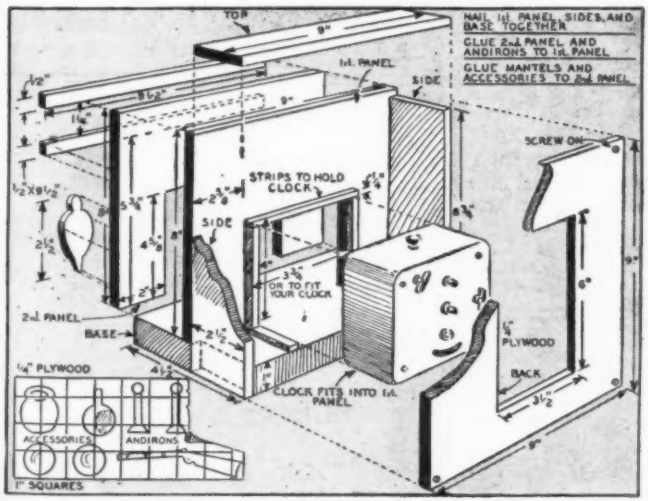
One Dollar Mantel Clocks

by
R. L. Fairall



A chateau or a small cottage may house your clock if it has a square face. These attractive designs may be varied according to your taste.

A NINETY-EIGHT-CENT alarm clock may be transformed into a gay, colorful mantel clock. It is built into a plywood cabinet having a novel design made up of layers of ¼-in. plywood as a face. A square clock is best suited for the designs shown in the illustration. First draw the design for the face of the cabinet on paper; then trace and cut out the various pieces of plywood for the face, sides, and back. Nail the first panel, sides, and base (1-in. pine stock) together. Insert the clock flush with the first panel, and tack ¼-in. strips around it; then put the back on with screws. Now the front design is built up of layers of ¼-in. plywood glued one over the other with hot glue as shown in the illustration. The base is flush with the first panel, and is covered by plywood. Paint with shiny enamel.

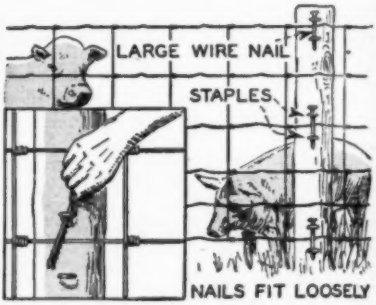


[*Continued on page 139*]

Old Auto Tire Makes A Good Chicken Trough

A DURABLE watering trough for foul can be made at little or no expense by cutting an old tire in half as shown. The cutting can easily be done with a very sharp knife. —*I. J. S.*

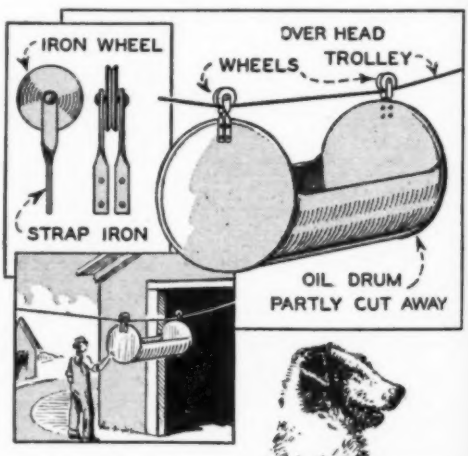
Removable Fence Uses Staples



WIRE fencing can easily be removed from the posts and be remounted if attached as shown. Ordinary staples are driven into the posts to take nails as illustrated. This provides a firm anchorage for the wire when in place, but may be removed at will, leaving staples in place for remounting of wire.—*R. F. K.*

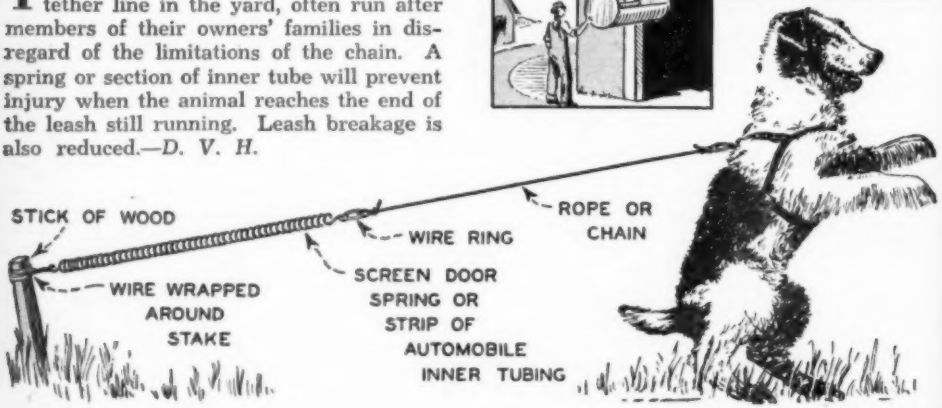
An Oil Drum Farm Trolley

A HANDY overhead "monorail" system for the farm can be made from an old oil drum, four pieces of strap iron, and the wheels from an old door track. The strap iron is twisted and mounted on the drum as shown, with the wheels running on bolts between. No. 8 wire should be used on long hauls and No. 10 on short ones.—*D. V. H.*



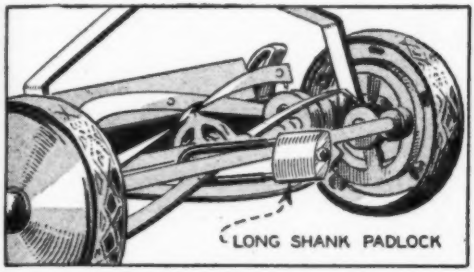
A Dog Shock Absorber

YOUNG dogs, when kept on a leash or tether line in the yard, often run after members of their owners' families in disregard of the limitations of the chain. A spring or section of inner tube will prevent injury when the animal reaches the end of the leash still running. Leash breakage is also reduced.—*D. V. H.*



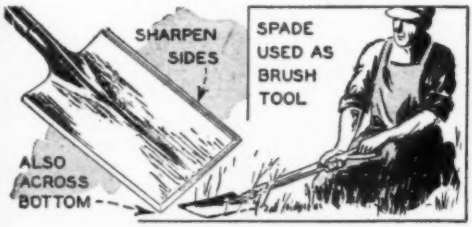
Mower Safety Lock

TO PREVENT children from injuring themselves by meddling with the family lawnmower, a bicycle padlock can be inserted over one blade and the cross rod. When locked as illustrated, danger is removed.—*A. H. W.*

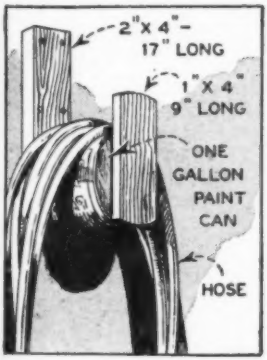


"Scythe-Spade" Cuts Weeds

BY SHARPENING the sides of a spade as well as the digging edge it is possible to clear off shrubs and brush more easily. The spade is used not only for forward chopping, but when a thick cluster of small shoots is encountered, the operator may drop to his knees and use the spade much as a scythe or axe, swinging the blade just on top of the ground. —*D. V. H.*

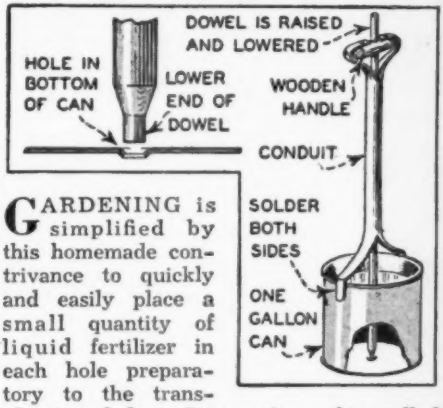


A Paint Can Hose Rack



AN OLD one gallon paint can and a few scraps of lumber are all that are necessary to make a good hose rack. Assembled, as shown in the drawing, and mounted in a convenient place, it will give years of service.

Fertilizer Dispenser

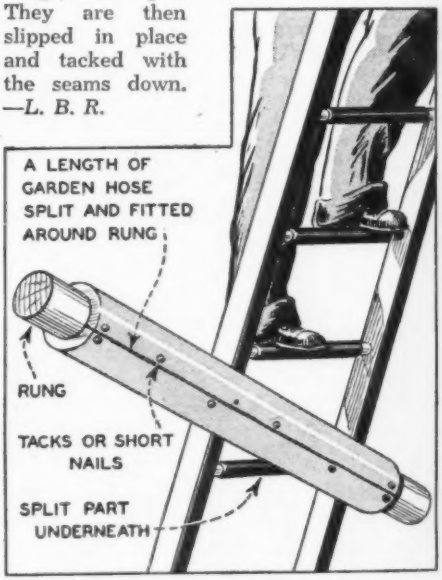


GARDENING is simplified by this homemade contrivance to quickly and easily place a small quantity of liquid fertilizer in each hole preparatory to the transplanting of plants. It comprises a thin walled pipe such as a steel conduit with both ends split. The upper end is bent over and around a short 1" dowel for a handle and the other halves are spread and soldered to opposite sides of a gallon pail.

[*Continued on page* 142]

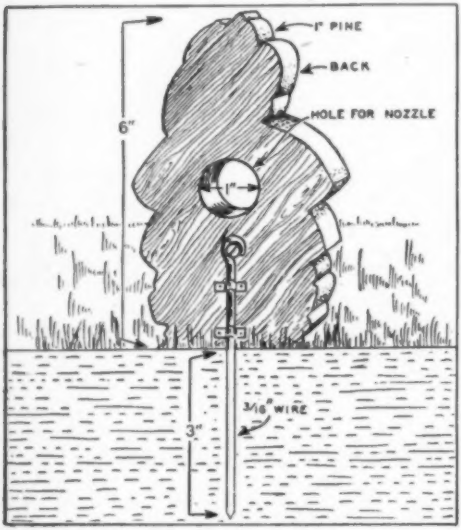
Safe Ladder Rungs

A LADDER may be made safer and more comfortable by covering the rungs with lengths of garden hose as shown. The pieces of hose are cut slightly shorter than the rungs, and split. They are then slipped in place and tacked with the seams down. —*L. B. R.*



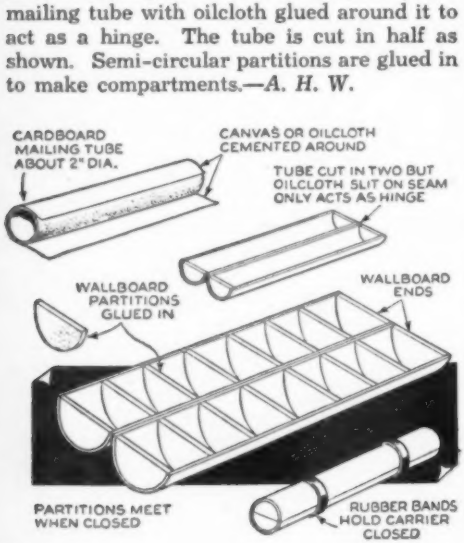
Little Wooden Men Water The Lawn

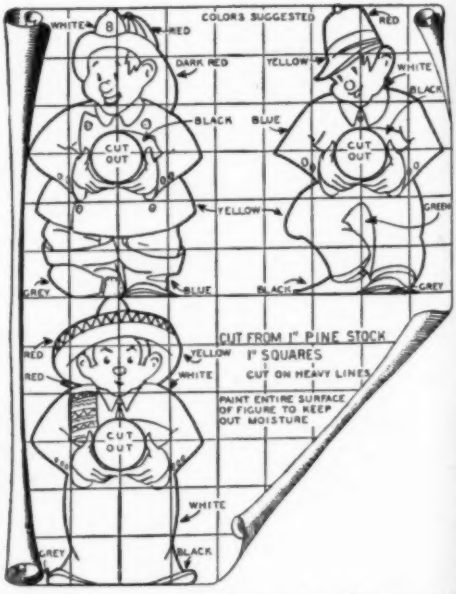
THESE 6″ men will gladly sprinkle your lawn. They are cut from 1″ pine stock and have a 1″ hole through them into which the nozzle of your hose may be slipped. Draw the design first on paper, then trace it to the wood. Cut the figure out with a jig saw and attach a piece of $\frac{3}{16}$″ wire to the back, as shown in the illustration, for a stake. Paint them suitable colors, using shiny enamel.—*R. L. F.*



Box For Small Parts

A GOOD container for an assortment of small shop parts can be made from a 2″ mailing tube with oilcloth glued around it to act as a hinge. The tube is cut in half as shown. Semi-circular partitions are glued in to make compartments.—*A. H. W.*


CARDBOARD MAILING TUBE ABOUT 2" DIA.
CANVAS OR OILCLOTH CEMENTED AROUND
TUBE CUT IN TWO BUT OILCLOTH SLIT ON SEAM ONLY ACTS AS HINGE
WALLBOARD PARTITIONS GLUED IN
WALLBOARD ENDS
PARTITIONS MEET WHEN CLOSED
RUBBER BANDS HOLD CARRIER CLOSED



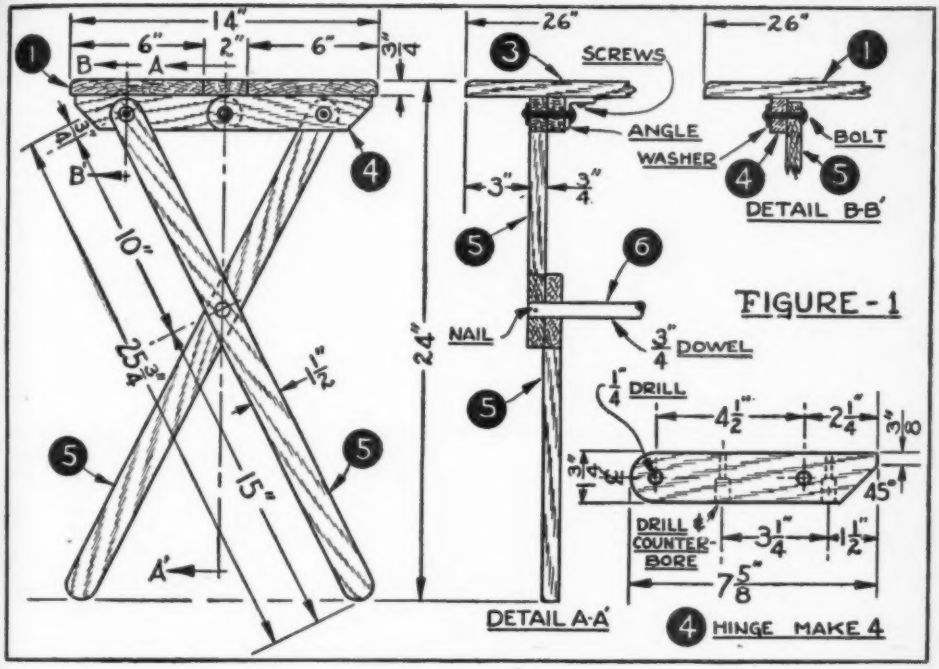


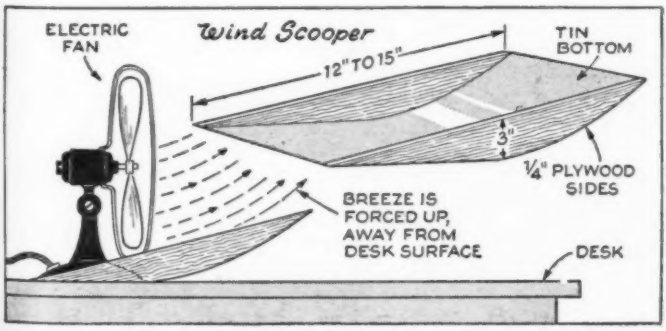
FIGURE - 1

Stained Wood Folding Table

FOLDING novelty furniture is always attractive during the summer months since it may be stored away in little space when not in use. When portability is desired it may be loaded into the car in a minimum of room. Here is a substantial and novel folding table which the home craftsman can make in three hours. When open the top space is 14″x26″ and when folded the centerpiece of the top affords a convenient handle by means of which the table may be carried in one hand. All stock used in the construction is of nominal 1″ thickness. Oak or maple is suggested as the material.

There are three top pieces as shown in Fig. 1. Two of these are 6″x26″ and are the outside pieces. The centerpiece is 2″x26″. Four of the hinge pieces are required, four legs and a ¾″ dowel 20″ long. The hinge pieces are assembled together in pairs along with an angle iron piece, using a ¼″x2″

[*Continued on page* 144]



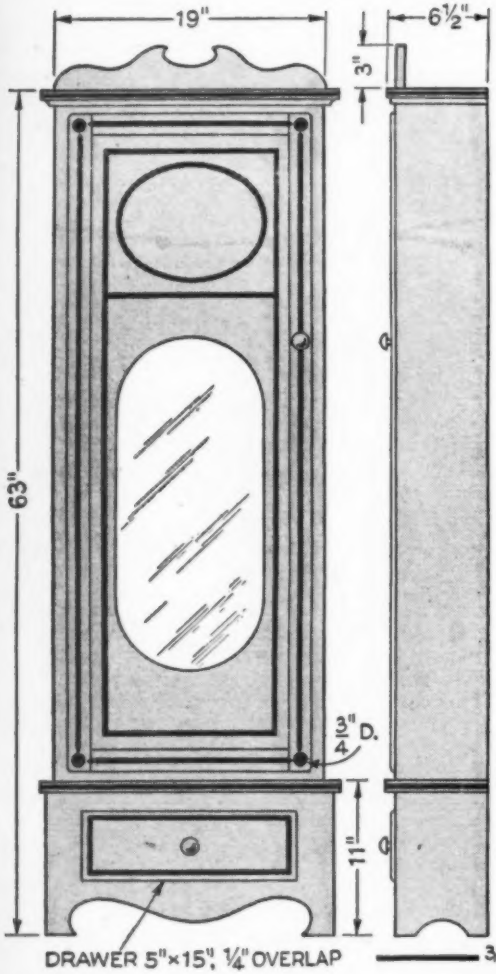
Directional Stream Fan

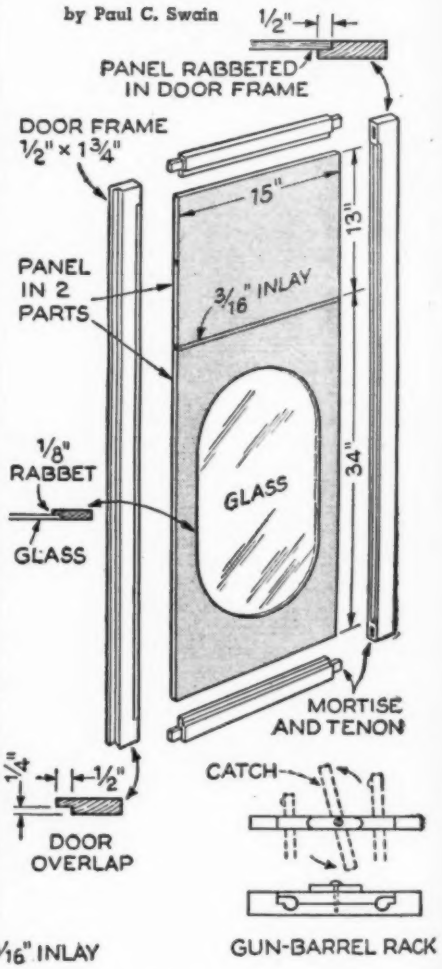
IT IS only necessary to saw out two pieces of plywood the size and shape indicated and cover the bottom with a sheet of tin to make this fan stream control. Note that one end of the sides

[*Continued on page* 144]

SPORTSMAN'S GUN CABINET

by Paul C. Swain





DESIGNED for two guns, this cabinet is made of solid walnut, inlaid with maple. The sides, top, and bottom pieces are made of ¾" walnut. The back is made of ¼" walnut (or plywood), set in a rabbet groove and glued. The door consists of a frame with a panel inside. The panel is ¼" walnut, set in a rabbet in the frame. This panel is in two parts for easier handling. The lower part of panel has an opening in which double-strength glass is fitted. The upper section of panel provides space for a picture inlay.

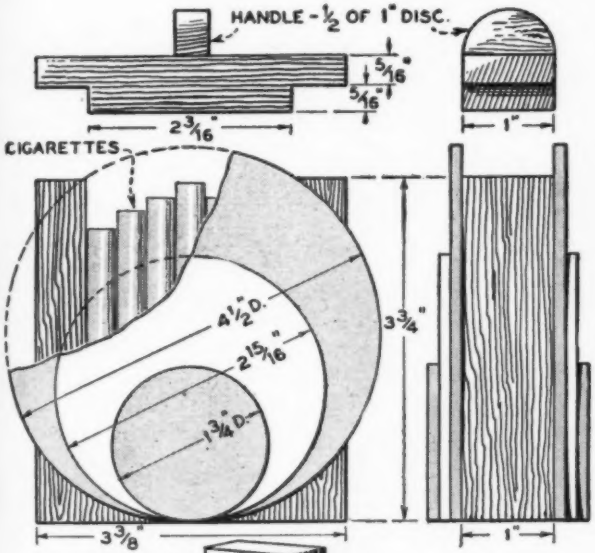
The wildlife scene in picture (see page 77) was traced on panel through carbon paper from a magazine picture. The objects in scene and the circular border were cut out to a depth of ⅛" by knife. This carved space is filled with white plastic wood and sanded level after thoroughly drying. The inlay on sides, door frame, drawer, the top and bottom pieces, and remainder on panel is made by cutting a groove 3/16" wide and ⅛" deep with a dado saw. The inlay strips are carefully sawed from maple and glued in place. The circular inlays are placed in ¾" auger holes. The scroll on top is attached with screws.

DISC CIGARETTE BOX

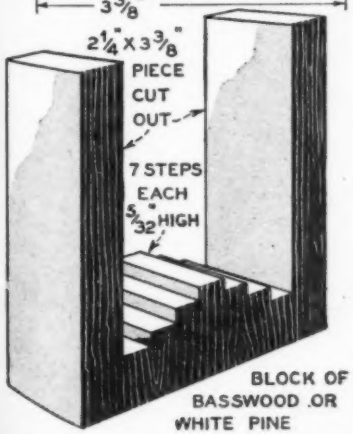
IDEAL for gift or home use on the living room table, this novelty cigarette box is easy to make. It will hold one pack of wrapped cigarettes, or 21 unwrapped cigarettes—3 on each of the seven ledges. The ledges step the cigarettes so that it is easy to take one even when the box is full.

The box itself is sawed from a block of white pine or basswood 1" thick, 3⅞" wide and 3¾" high. The inside cut is made to give a width of 2¼", with a maximum depth at the sides of 3⅜". The steps themselves are $\frac{5}{16}$" wide and $\frac{5}{32}$" high. This permits the cover to barely touch the three center cigarettes. Square and sand this piece well.

Next saw out three pairs of the wood discs. All are ⅛" thick. The two largest are 4½" in diameter, of walnut. The middle two are of white pine or basswood, $2\frac{15}{16}$" in diameter. The smallest two are of walnut and are 1¾" in diameter. These are well sanded, then glued together to form the sides with all disc edges touching the bench at the bottom and all grain running vertically. While these are being glued up, saw out the lid and shape and fasten the handle with a single screw, or merely glue it in place. It is a half disc 1" in diameter, ⅜" thick.



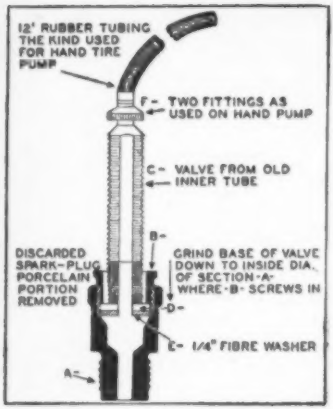
THE SMALLEST AND LARGEST DISCS ARE MADE OF WALNUT THE MIDDLE DISCS ARE MADE OF WHITE PINE OR BASSWOOD



Carefully fill the walnut with paste filler to which walnut stain has been added. The white pine should need no filler, but if you use it, apply it without stain. These light and dark woods (you can find several nice combinations such as maple and mahogany), provide the striking contrast which enhances the beauty of the project. Of course be sure no filler covers any portions which later are to be glued together.

To finish the job, glue the disc sides to the box proper, seeing that box and disc bottoms all come in contact with the table. Thus the box is quite stable, since 1¾" of wood touch at the bottom.

A clear lacquer coat sprayed on makes an ideal finish. This may also be thinned slightly and brushed on. When this has dried, rub lightly with steel wool, then wax. Glue felt to the bottom.—*Dale Van Horn.*

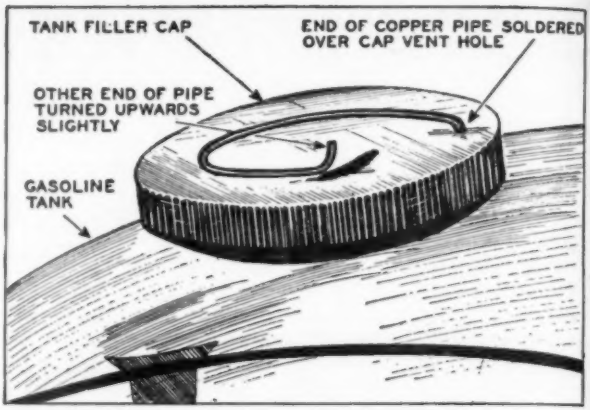

12' RUBBER TUBING THE KIND USED FOR HAND TIRE PUMP
F- TWO FITTINGS AS USED ON HAND PUMP
C- VALVE FROM OLD INNER TUBE
B-
DISCARDED SPARK-PLUG PORCELAIN PORTION REMOVED
GRIND BASE OF VALVE DOWN TO INSIDE DIA. OF SECTION -A- WHERE -B- SCREWS IN
D-
E- 1/4" FIBRE WASHER
A-

Compressor Tire Pump

A TIRE pump operated by the compresson of a car's motor can be easily made from parts usually found around a garage.

A discarded spark-plug, the same size used in your car is taken apart and the porcelain portion removed. The metal portion which consists of parts

[*Continued on page* 143]

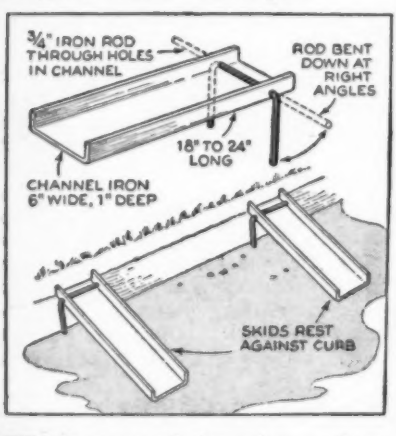


Anti-Spill Gas Tank Vent

WHEN a motorcycle fuel tank is full the gasoline often persists in running out through the filler cap vent hole. This not only means a waste of fuel but quite often causes a fire as well. However, if a curled copper pipe is sweated over the vent hole, as shown in the accompanying sketch, both difficulties will be overcome.

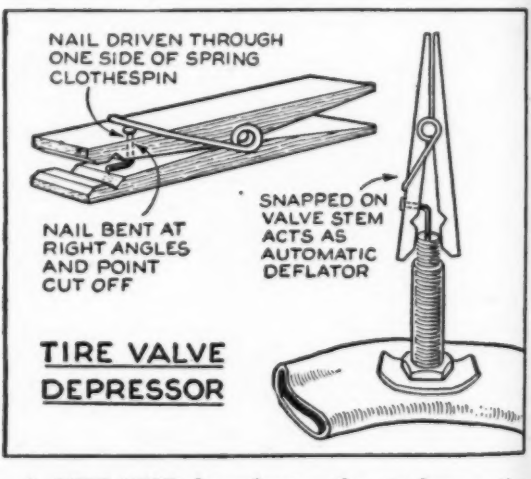
This same device may be affixed to the tank filler caps of other vehicles. A great many cars lose gasoline through the inlet pipes of their tanks after filling. The spilling occurs during turns.—*I. J. S.*

Light Curb Ramps


¾" IRON ROD THROUGH HOLES IN CHANNEL
ROD BENT DOWN AT RIGHT ANGLES
18" TO 24" LONG
CHANNEL IRON 6" WIDE, 1" DEEP
SKIDS REST AGAINST CURB

TWO pieces of channel iron about 18" or 24" in length with ¾" iron rods run through holes in one end and bent as shown, make handy portable curb ramps. Channels should be wider than tires.—*A. H. W.*

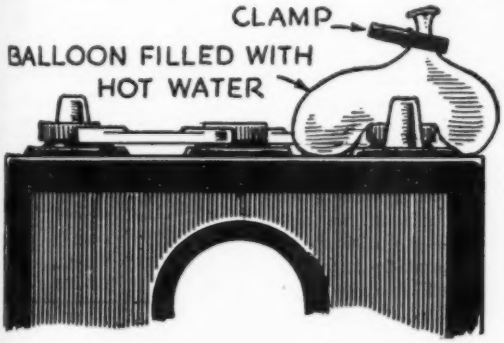
A Handy Tire Deflator


NAIL DRIVEN THROUGH ONE SIDE OF SPRING CLOTHESPIN
NAIL BENT AT RIGHT ANGLES AND POINT CUT OFF
SNAPPED ON VALVE STEM ACTS AS AUTOMATIC DEFLATOR
TIRE VALVE DEPRESSOR

A DEFLATOR for releasing the air from a tire easily and quickly can be made by driving a nail through half of a spring clothespin, bending the nail at right angles, and cutting off the point. The clothespin snaps on the stem and the end of the nail presses down the valve.—*A. H. W.*

Self Starting Siphon Avoids "Mouthful"

TO MAKE a self starting siphon, cork one end of a rubber tube of suitable length and roll the corked end up into a tight spiral, like a snail shell. Do this by rolling it along the floor or other hard surface, as that makes it easier to roll tightly. This flattens the tubing and drives out the air. Now insert the open end into the tank to be siphoned and release the spiral. As the tube re-assumes its shape and unwinds, a vacuum space is established within, which partly fills the other end of the hose. Now remove the stopper and there's your self starting siphon.—*A. V.*

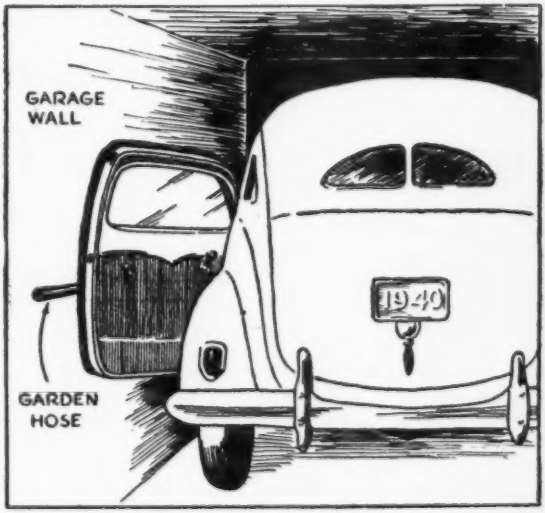


Removing Battery Caps

A LARGE percentage of broken and cracked battery cell caps can be traced directly to attempts to remove corroded or otherwise tight fitting caps during cold weather when the hard rubber or composition is in an extremely brittle state. To eliminate as much as possible this danger of damage, try the idea of partially filling a toy balloon with hot water, clamping the neck shut and laying the balloon over the cap before trying to unscrew it.

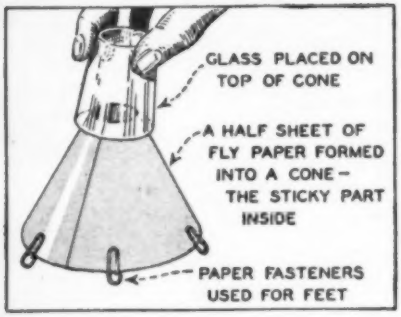
Garden Hose Saves Auto Door Finish

IT IS often difficult, particularly in one car garages, to open the doors of the car sufficiently to allow the passengers to get out, without striking the door against the side wall of the garage. In many cases the wall is either of stone or some other material having an abrasive surface that damages the finish on the door edges when they contact it. It is a simple matter to fasten a length of old garden hose along the wall at the height of the door's contact. Then when the doors of the car are opened they will strike the cushioning hose instead of the hard wall. The paint will last much longer that way.



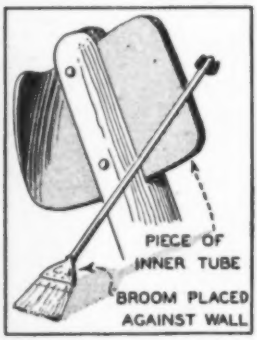
HELPFUL HINTS

Tumbler Flytrap


GLASS PLACED ON TOP OF CONE
A HALF SHEET OF FLY PAPER FORMED INTO A CONE – THE STICKY PART INSIDE
PAPER FASTENERS USED FOR FEET

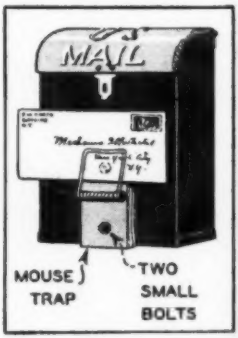
A FLYTRAP which can be made in a few minutes, and which is positive in its action, is the one shown in the accompanying illustration. It consists of a half sheet of sticky fly-paper which is rolled into a funnel, in which shape it is self cemented. Several paper clips are attached to the large end of the funnel to serve as elevating feet, and a tumbler is placed over the top. A little sugar scattered under the funnel will coax the flies within but on their attempt to leave they invariably fly against the sticky inside surface of the paper and are caught. Any escaping are trapped in the tumbler.—*E. V. H.*

Rubber Fin Broom Stands Against Wall



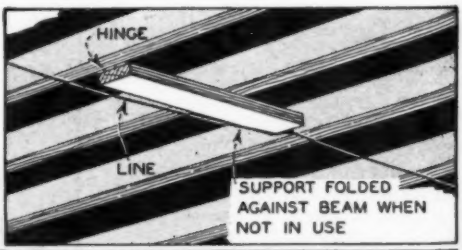
HOUSEWIVES who are annoyed by having a broom fall to the floor when it has been hastily leaned against the wall may easily obviate this trouble by sawing a slot in the end of the handle at right angle to the brush of the broom and inserting a double fin of rubber cut from an innertube.—*E. V. H.*

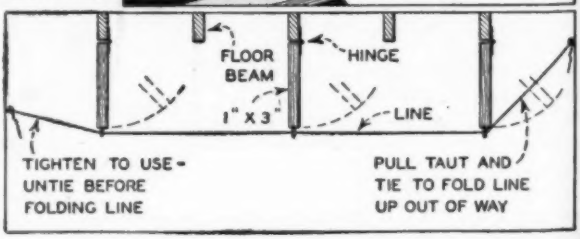
Mousetrap Mailbox Holds Envelopes



A GREAT many mailboxes make no provision for the safe and conspicuous holding of outgoing mail for the mailman to pick up. A simple device for holding the mail firmly in an obvious position can be made from an old mousetrap. The trap is fastened to the front of the box as shown in the drawing, and the envelopes to be mailed are clipped under it.—*A. H. W.*

Basement Clothesline Folds Up On Ceiling



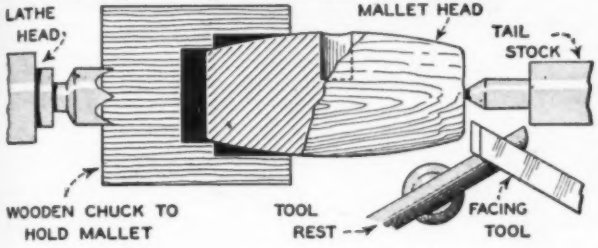


BY HANGING a number of short 1"x3" boards from floor beams along close to one wall, with hinges, a clothesline may be dropped and fastened for use by tying a rope at one end, or pulling line and supports up out of the way by tying a rope at the other end. The hinges are put on so that when the boards are down, they will stop in a vertical position. Thus by tightening one rope, the line is made taut.

When this rope is untied and the one at the other end pulled, the whole unit fits up against the joists, out of the way. Fasten line with screw eyes.—*D. V. H.*

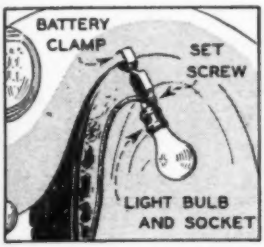
FOR THE HOME OWNER

Dressing Croquet Mallet Heads



CONTINUED use finds the heads of croquet mallets battered and uneven. The jig illustrated herewith permits facing without the end being damaged by the live center of the lathe. As practically all mallets are tapered, this device is applicable. In case the heads are straight, make a bore in the block with a slight taper.—*L. R. B.*

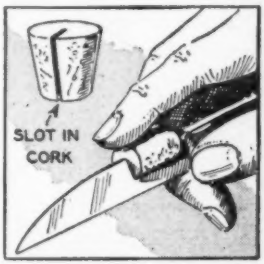
Battery Clamp Holds Extension Light Steady



A BATTERY clamp fastened to the socket of an extension cord in the manner shown enables one to fasten the cord any place and in any position.

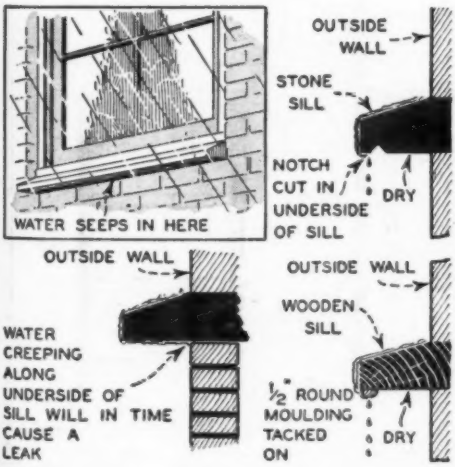
No holes need be drilled as the socket comes equipped with the set screw and the battery clamp has a corresponding hole.

Cork On Paring Knife Protects Fingers



A SMALL cork, slotted so that it will fit over the blade of a paring or slicing knife, will protect the index finger when applying pressure while cutting foods. The same type of slotted cork can be used with a penknife when carving wood. This is of particular use when a considerable amount of work is to be done.

Moulding Or Notch Stops Window Leaks



RAIN leaks coming through a wall are frequently traced to cracks along the underside of a window sill. Often these are on the floor above; the rain seeping in, traveling down within the wall, then emerging in the room below. These leaks are caused by the fact that the underside of the sill is practically level, rather than sloped upward. The water washes along the top of the sill, tumbles over the edge, then clings to and creeps along the bottom surface toward the wall where it gradually works its way in. To correct the situation chisel a "V" notch along the entire length of the sill in the underside close to the edge as shown. The water film creeping down and around the lower edge then simply drips off the sill, leaving the sill dry from the notch back to the wall.

Another method is to nail a half-round moulding to the underside of the sill as shown, which accomplishes the same effect. This should be done before the damage is done by rain.—*A. V.*

MODERN STYLE MAGAZINE RACK

From Planks And Pipe

YOU'LL be proud of this distinctive magazine rack when friends drop in. Its construction is simple. Just five walnut boards and three pipes are required. Then there's the crowning note—the reading lamp at the end. This permits the rack to serve a double purpose. If desired, it may be placed between two easy chairs, thus enabling two persons to enjoy the project at the same time. A glance at Fig. 1 will suggest the possibilities.

The bent side pipes are filled with lead to prevent any danger of their collapsing, and to give added ruggedness. This preliminary chore isn't as difficult as it may sound. The best pipe to use is electrical steel conduit—

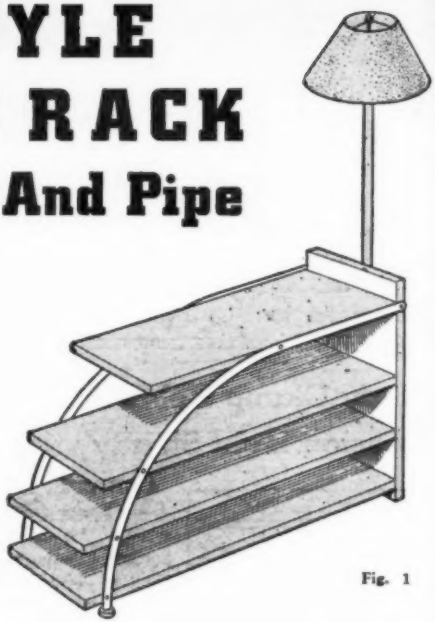
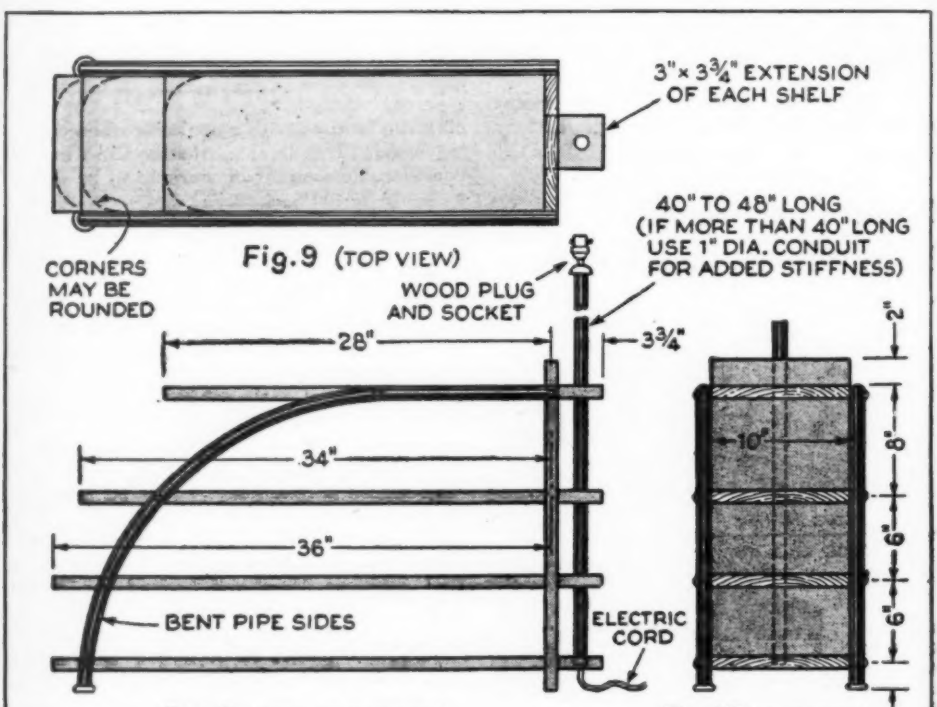
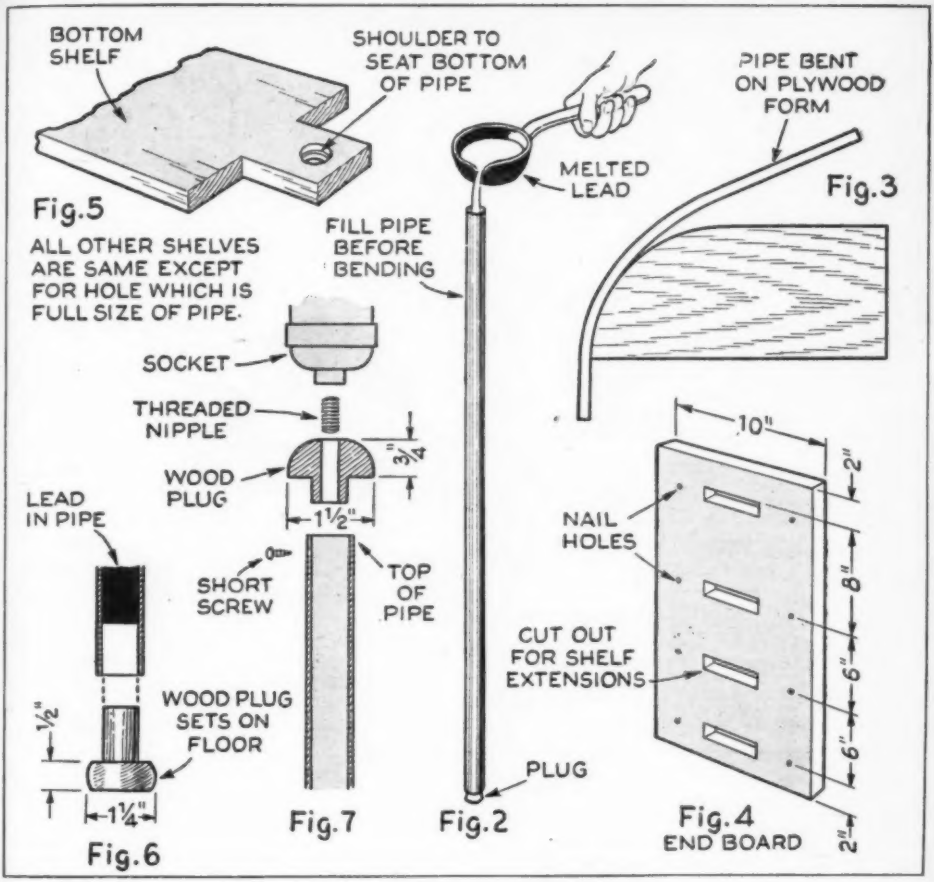


Fig. 1





seamless tubing of soft steel with comparatively thin walls.

Electrical houses have this steel conduit in stock or can get it for you. It comes in the following sizes: ½", ¾", 1", 1¼", and 1½". The side pipes should be the ¾" size, which means ¾" inside diameter. If you prefer the vertical lamp pipe no more than 40" high, the same size should be used for this also. However, if you choose a taller type of lamp, then it will be better to use the 1" diameter for the lamp support, for added rigidity. The lamp support is simply cut to length and left until assembly. The side pieces should be cut 50" long, which will allow an inch or two of waste which is later sawed off. Cut two wood plugs with straight walls for about an inch, which will drive to a tight fit in the bottom ends and leave space when pulled later for the turned wood feet shown in the drawings.

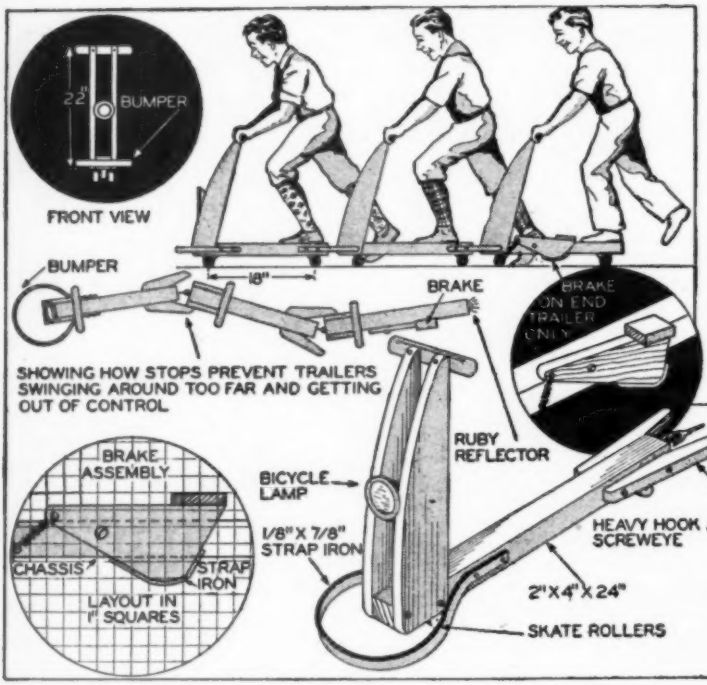
Melt some lead and, standing the pipes with plugs down, fill them as indicated in Fig. 2. One good way to fill them is to turn a large screw eye into the edge of the bench and slip the pipe through this so that it will not have to be held in the hands. The lead will cool in a few minutes.

Now with a wire brush wheel on a motor shaft or in the lathe, remove the zinc plating from the pipe. This done, scour each with emery cloth.

From a piece of fairly thick plywood or a built-up pattern from boards and cleats, cut a jig as shown in Fig. 3 around which the pipe is to be bent. This should be of the same curve as that of the finished pipe. The pipe will spring a very little and so must be further bent by hand until the "at-ease" position just fits the curve of the jig. If this isn't

[*Continued on page* 142]

Speedy Sidewalk Snake-Scooter



A TRAIN of sidewalk scooters is a lot of fun, especially when they are coupled together in such a manner that they cannot buckle and get out of control. By means of stops attached to the rear end, none of the train can turn at more of an angle than 20 degrees from that ahead or behind it. Moreover, couplings made of a sturdy hooks [*Continued on page* 144]

Pup Tent "Pent House"

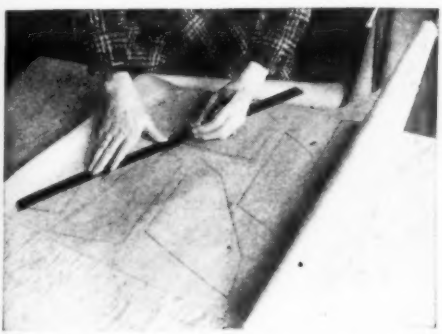
MAKE this "retreat" tent, setting it high between two trees and constructing a small platform and box just large enough for a canvas shelter or pup tent. It will be a high, cool spot for either back yard or camp. Find two trees not more than 10 or 12 feet apart, and, with the aid of a ladder, nail two horizontal two-by-fours or two-by-sixes to opposite sides of the trees at a height of about 10 feet, to form the supporting frame. Fasten the support to the trees with long spikes, and further strengthen it with rope trusses attached to the ends of the timbers and to overhead limbs. Use two-by-four timbers nailed as shown for braces, attaching them to the horizontal pieces and to the tree trunks. Make a box platform as long as the tent and about 5 feet wide. Nail the sides and ends of the box together, using boards 12 inches wide, and nail 5-foot board sections [*Continued on page* 144]

"Bonnie," 18-Ft. Plywood Cabin Sloop

[*Continued from page 86*]

Laying out curves on full-sized drawing with aid of long batten.

Frames are checked for accuracy on body plan before assembling.

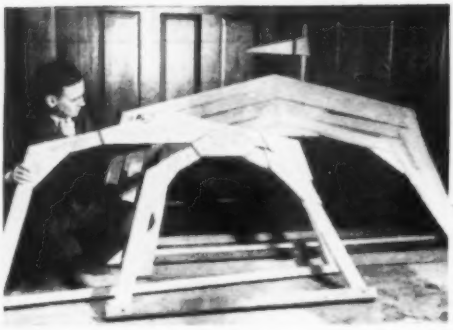


Gussets are transferred from tracing paper to plywood sheet.

Coat frame joints and underside of gussets with red lead, then screw together.

clamp the gussets and floor beams to the frames, fastening in place with 1½-in. No. 10 flat head brass screws driven from plywood into oak. When all have been completed cross-ties of scrap lumber are fastened flush across the open ends or tops of the frames. These cross-ties, incidentally, must be good and strong; not smaller than 1 x 4, as they must bear the weight of the hull until it is turned rightside up. It is suggested that they be bolted through the frame ends. The six assembled frames may now be laid aside until needed.

The three parts of the stem are cut from one piece of yellow pine, 6 x 3-in. x 6 ft. long. If you have a fairly heavy band saw you can cut the pieces yourself; otherwise a local mill will do the job for a few cents. Mark the three sections accurately on the wood from the full-sized drawing previously made. After they have been cut out mark the taper at the front edge, using cross-section sketch as a guide. Clamp each piece to the workbench and trim with a drawknife, smoothing off with a jack plane. The piece at the bottom has very little taper, being practically flat where it runs into the keel. The photos show this clearly. Place the stem pieces on the floor and fit them together. The lock scarphs should fit snugly, and the whole go together like pieces in a jigsaw puzzle. If your drawing was accurate, no further trimming will be needed for a perfect fit. Take the stem apart, paint the joints with red lead, reassemble and bolt together with bronze or galvanized carriage bolts of the sizes indicated in the Bill of Material. Countersink the heads in the outside of the stem. If the boat is to be used in salt water it is best to employ bronze and brass fastenings throughout, as these will materially add to the life and value of the boat and be well worth their extra cost. The stem may now be roughly rabbeted with mallet and chisel, or you may wait and cut the rabbet after the framework has been set up. If you have never built a boat before it is best to leave the rabbeting until later. It will be noted from the drawings that the stem must be rabbeted to two depths; the top half to take the ⅜-in. side planking and the bottom half for the ½-in. bottom planking. Of course, if you decide to use the same thickness planking throughout, the rabbet can be the same depth all the way. We advise, however, following the specifications for best results. The stem must also be



The completed frames, with crossties in place.

Stem is trimmed roughly to shape with a drawknife, after being band sawed.

notched for chines and sheer strips, but this too, is best done later on.

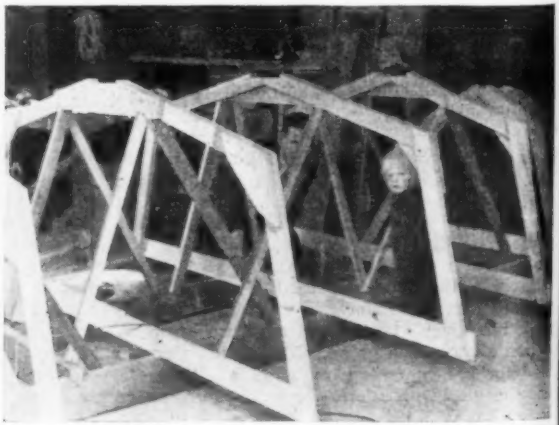
The transom, transom frame and knee come next to our attention. Super-Harbord ¾-in. thick is used for the transom itself. Cut to shape and dimensions indicated. Assemble the 1 x 3-in. oak transom frame on the transom, fastening with 1½-in. No. 10 flat head brass screws. Be sure to allow about a half-inch of oak to project out over the sides and bottom of the plywood transom; this takes care of the bevel for the planking later on. Mark the outlines of the transom knee accurately on a piece of 8 x 2-in. oak 3 ft. long and band saw to shape. Fasten the knee to the exact center of the transom ⅝-in. above the bottom edge with 5/16-in. carriage bolts run through from the outside with heads countersunk. The ⅝-in. clearance allows a notch to be cut in the transom frame to receive the end of the keel.

The next job is to prepare the 16-ft. lengths of long leaf yellow pine which become keel and keelson. They must be tapered from station 2 forward and from station 5 aft. Unroll your large profile drawing, lay it flat on the floor and bend the keel around the keel line on the paper. Use heavy weights to hold it in place and on edge. Mark off each station line on the keel in its proper position, as well as the location of the centerboard slot. It is possible to do this without the full-sized profile drawing by taking the measurements given in the drawings, but because of the curve in the keel the method described above is most accurate. Now turn the keel plank flat and rule off the taper, taken from the half-siding of the keel shown in the plan view. Copy these marks on the keelson and rip out both pieces to the taper line, either on the circular saw or by hand. Next, cut out the centerboard slots, using care to get them both alike. You will have found that the 16-ft. planks are a bit too long—they should be trimmed to exact length at the forward ends and allowed to lap over aft, for the time being.

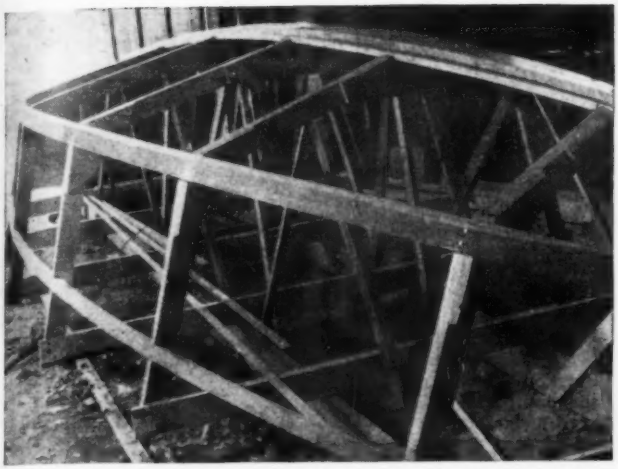
The Building Frame

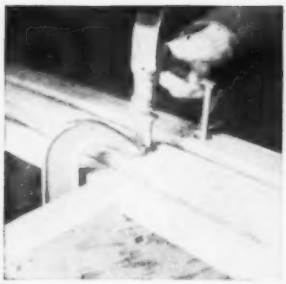
You have now reached the point of setting up the building frame, upon which the hull will be constructed. Obtain two cheap but straight 2 x 6's

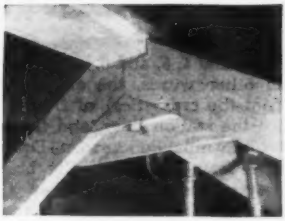
The stem rabbet is marked carefully, then cut out with sharp chisel and mallet.



Frames are set up, plumb and square to building frame, then braced and nailed securely in place. Note positions of braces.





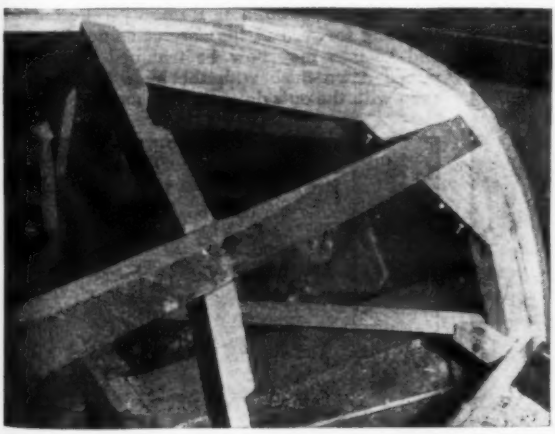


At this stage the boat is almost ready to plank. Frames have been beveled and chine trimmed until it is flush with the bottom. Keelson remains to be beveled. View is looking aft. Top right: Driving the carriage bolts through keel assembly and frame. Right: Closeup of frame No. 1 showing V shaped filler block which anchors bolt.

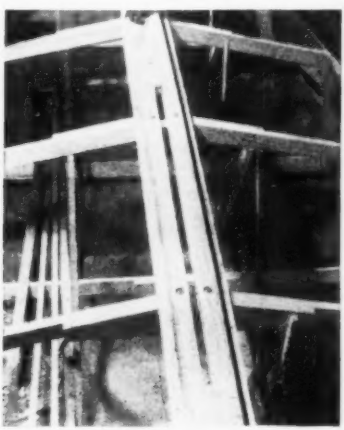
18 ft. long. Place them parallel on edge about 30-in. apart upon the building site. Take care to have them exactly level—if the ground or floor is uneven the planks must be shimmed up until they are dead level. Nail pieces of scrap lumber across the ends with heavy galvanized nails, and fasten three or four cross braces in between, to give a very rigid assembly. Give the frame a final check for level and run a strong cord along the *exact* center from end to end, pulling it taut and tacking it down securely.

Setting Up The Framework

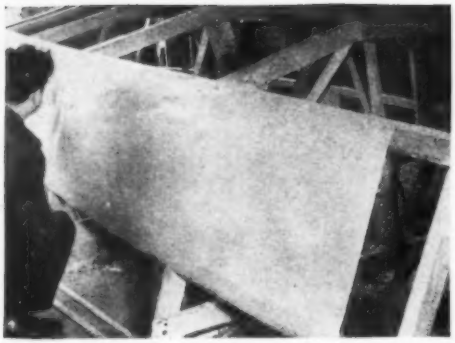
Bring out the six completed frames, dust them off and mark a center line on each cross-tie. Cut a notch the width of the keelson and $\frac{5}{8}$-in. deep in the bottom of every frame. It will be necessary to bevel these notches so the keelson will fit perfectly flat in each one despite its curve; the bevels can be taken from the profile drawing or determined by setting the frames up temporarily and running a batten across the bottoms, now become the tops. In any case, cut the notches carefully and set the frames on top of the building frame, after first marking station lines on the latter. This part of the work must be done with great care, as the correctness of the finished hull depends upon it. Be sure the center line of each cross-tie is directly over the taut cord indicating the center of the building frame. Frames 1, 2, and 3 must be placed *just forward* of the station



Chine and sheer strips are notched into stem. Piece between sheers will be replaced by permanent breasthook. Chine has not yet been completely beveled.



Marine glue is spread between keel and keelson around centerboard slot.



Left: Making a paper pattern for one of the side planks. Below: Cotton flannel is laid along chines, keel, etc., and generously impregnated with liquid marine glue.

lines, and 4, 5, and 6 *just aft* of their station lines. In other words, the aft edges of the oak parts (not the cross-ties) of frames 1, 2, and 3 should toe the station lines, and the *forward edges* of 4, 5, and 6 must do likewise. Drop a plumb line from each frame before finally bracing it in position. Any scraps of light lumber will serve as braces, and may be nailed to the frames in convenient places, then down to the building frame. The only thing to watch here is that none of the braces will interfere with keelson or chines. After all frames have been securely braced in their correct positions and cross-ties nailed to building frame you are ready to bend in keelson and keel.

First lay the keelson in its notches and bend it down to frames 1 and 6, clamping it at those points. Place the keel on top of the keelson, centered, bend it down and clamp. Two 5/16-in. carriage bolts are run through keel, keelson and frame, with heads countersunk in the keel at each frame except frame 1, where only one bolt is used. A filler block is placed in the V at this frame, through which the bolt is fastened (see photos). At frames 3 and 4, where they cross the centerboard slot the bolts must clear the slot by 1-in. on each side. This is to allow for the sides of the centerboard trunk.

The transom with its attached knee is next set up in position on the building frame. Since it was extended solid to the baseline there is no problem involved in bracing it. Simply nail the extension to the building frame with the transom inclining forward at the correct angle. The keel and keelson may now be trimmed until, when pulled down flush with the knee they are just even with the outside of the transom. Next, notch

Boiling water poured on the bow bottom plank softens it so bending is fairly easy. The heat does the trick, not the water.

the transom frame 5/8-in. deep for the keelson, and rasp the end of the latter until it seats nicely in the notch. Fasten securely with carriage bolts in the same manner as the frames.

The stem can now be brought out and fitted temporarily in place. If all has been done carefully up to this point, you will find that the keelson and keel fit right into their stem notches with only a slight further bending by clamps needed. In the event that they are slightly too long to fit perfectly rasp them until they do. The stem can be bolted temporarily in position with two long carriage bolts.

Chines and Sheer Strips

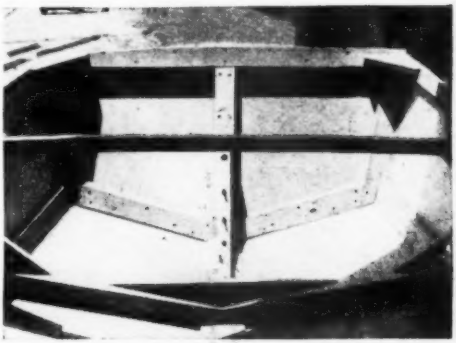
The framework has now become a rather rigid unit, but nothing compared to what it will be after chines and sheer battens have been put in. The former consist of two pieces of white oak 7/8 x 2 3/4-in. x 18 ft. long. The sheer strips are somewhat smaller, being 7/8 x 1 3/4-in. x 19 ft. long. Notches must be cut in the frames to accommodate these pieces. First cut the chine notches, allowing the chine to fit even with the side angle of the frames and project slightly above the bottom, to be beveled flush after fastening. The correct fore and aft bevel of the notches can be obtained by bending a long, light batten around the sides of the frames and marking the angle on each. After the notches, including one in the transom frame, have been cut, bend in the chines and fasten with two 2-in. No. 10 flat head brass screws into each frame. The wood should bend in cold, but if it is very stiff pour boiling water over the sharpest part of the curve, working it in gradually. Mark off the sheer line on the frames, cut notches and bend in the sheer battens in the same manner as the chines.

At this point the framework begins to look like a boat. The next task is to bevel all the frames, sides and bottom, until a continuous smooth surface with no corners or edges is attained, on which the planking will fit like a glove. The sides are easy as it is only necessary to plane them down until they are flush with chines and sheer strips. You do not need to bevel the parts of the frames below the sheer, as they will be cut off later. The frame bottoms can be beveled by following the curve of the keel. Check your beveling as you go along by laying a long, light batten over the frames. When the batten lies flat against every frame, the job is finished. The transom must, of course, also be beveled, as well as the keelson. Trim the latter until a flat board placed along a frame will snuggle up against the keel without any gap showing underneath.

Now unbolt the stem and roughly chisel out the rabbet, following the cross-section drawing. Cut the notches for the chines and sheer strips. They must be deep enough so that the ends of these pieces will fit flush into them, the outsides level with the planking rabbet. Replace the stem, tightening the bolts and fastening the ends of chine and sheer pieces in their notches with 2-in.

Caulking is not necessary, seam compound alone being run into the seams.

Closeup of breasthook fastened in place.



Transom after extension has been cut off, but before final trimming. Note stern side knees.

No. 10 screws. The stem was purposely made heavy so that this could be done, as it is a stronger method of construction than the usual one of beveling the ends of the chines and sheers and screwing them to the surface of the stem. Check the rough rabbet with a strip of wood several inches wide and 5 or 6 ft. long. Lay the wood along the frames near the bow, clamp it and bend the end down into the rabbet. Do this at intervals, trimming the rabbet as you go, until the plank fits neatly into the rabbet everywhere. Toward the bottom of the boat, where the keelson runs into the stem rabbet, the angle becomes flatter. The rabbet from chine to keel must be

[*Continued on page* 136]

The MI "pee-wee" PORTABLE

"So light a child can carry it" is no idle boast in the case of the MI "pee-wee" portable radio. Set it anywhere and it brings in plenty of broadcast stations.

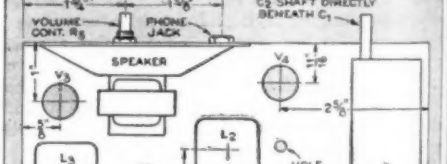
by Howard G. McEntee

THE tremendous popularity achieved by small battery-operated portable receivers last summer was one of the major phenomena of recent radio history, and this popularity appears certain to be far surpassed during the present season. Users of these receivers have found that they are not only outdoor or vacation-time outfits, but are extremely handy for all sorts of purposes the year round.

Since the first of these receivers was brought out, there have been several major developments tending to make possible even more compact equipment. Among the most interesting of these are the new miniature receiving tubes and a compact layer-built "B" battery of very high efficiency. Very few sets, if any, have thus far been marketed with these new parts, so it was decided to see what could be done in the way of a really small and lightweight outfit which anyone with reasonable radio experience could build. The result is the MI "pee-wee" portable, which weighs only 8¾ lbs., and measures 10¼"x8"x4½"; this is smaller than the majority of commercial sets. Furthermore, full-size standard batteries are used, assuring operating life as good as most larger sets. It is of course impossible to give more than the roughest approximation of this life, but in general a set of batteries should give at least 150 hours of service, and in most cases much more.

There are no tricks whatever to construction or operation of the "pee-wee," so the reader need not be a radio expert to tackle the job.

The case is the first requirement and may be obtained from most luggage stores. It is a type known in the trade as a make-up bag. The one used here is covered with genuine leather and costs about $5.00; those covered

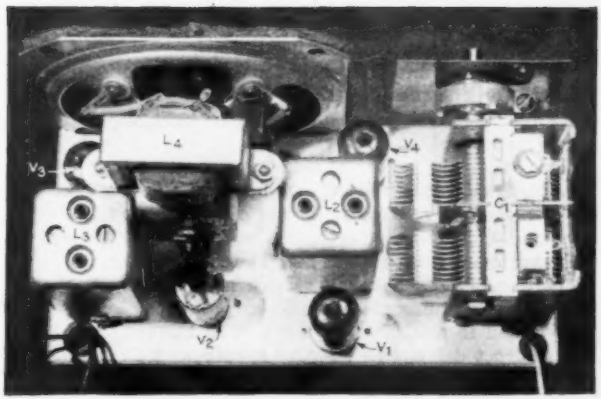


Although the chassis is small, there is comfortable space for all the parts. Compare this layout with the photo of the actual chassis at the top of the next page.

with cloth can be purchased from 79c up. The inside dimensions should be no less than 9¾"x7¾"x4¼", but of course may be more. A case could be made at home from ordinary ¼" plywood if desired.

The cloth lining of the case is removed and the mirror in the lid is also taken out. The inside is then smoothed off and given a coat of paint for neat appearance.

The shelf upon which the chassis rests is of ⅛" plywood, glued in place. Strips of wood are also glued in to keep the batteries from sliding about.

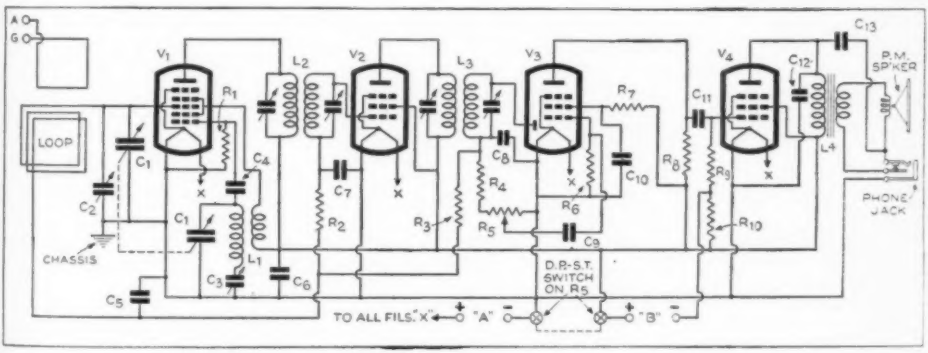


The complete chassis of the "pee-wee" portable. The parts are marked to correspond with the schematic diagram below.

The aluminum chassis is bent from a sheet 9½"x5"x$\frac{1}{16}$" thick, to give a finished base as shown in the drawings. The two front corners were soldered with Alumaweld to give added strength. This takes a great deal of heat and many builders may not wish to try it, in which case simple bolted angles will do very well. The chassis *must* be strengthened, however.

The chassis layout is given in simplified form, that is, only the approximate positions of the parts are shown, without all the mounting holes. This layout should be followed as closely as possible. If any alterations are made, try to keep all parts as far toward the front edge of the chassis as possible. The reason for this is that metal parts near the loop must be kept to a minimum; this is the reason the back of the chassis is left open.

The speaker with output transformer mounted was a bit too high for the case used,



V1—Type 1R5 (R. C. A.)
V2—Type 1T4 (R. C. A.)
V3—Type 1S5 (R. C. A.)
V4—Type 1S4 (R. C. A.)
C1—365 mmf. dual condenser (Meissner 21-5214)
C2—25 mmf. trimmer condenser (Meissner 21-5174)
C3—175-500 mmf. padding condenser (Meissner 22-7005)
C4, C8—50 mmf. mica condenser (Solar MO1410)
C5—.05 mf. paper condenser (Solar MP4145)
C6, C13—.1 mf. paper condenser (Solar MP4157)
C7, C9, C11—.01 mf. paper condenser (Solar MP4141)
C10—.25 mf. paper condenser (Solar MP4162)
C12—.004 mf. mica condenser (Solar MW1237)
C14—8 mf. 100 V. electrolytic condenser (Solar M108)
R1, R2—50,000 ohm ½ Watt resistor (IRC BT ½)
R3, R9—2 meg. ohm ½ Watt resistor (IRC BT ½)
R4—20,000 ohm ½ Watt resistor (IRC BT ½)
R5—1 meg. ohm variable resistor (IRC D13-137)
R6—10 meg. ohm ½ Watt resistor (IRC BT ½)
R7—3 meg. ohm ½ Watt resistor (IRC BT ½)
R8—1 meg. ohm ½ Watt resistor (IRC BT ½)
R10—500 ohm ½ Watt resistor (IRC BT ½)
SW1—DPST switch to fit on R5 (IRC No. 42)
Loop—Loop antenna (Miller 703 A)
L1—Oscillator coil (Meissner 14-4034)
L2—Input I. F. transformer (Meissner 16-6658)
L3—Output I. F. transformer (Meissner 16-6660)
L4—Speaker output transformer (Oxford 21J75)
SPK—4" permanent magnet dynamic speaker (Oxford 4ZMP)
Sockets—Four 7-pin button type (Cinch 2557)
"A" battery plug—(Cinch 2744)
"B" battery plug—(Cinch 2731)
Vernier attachment for C1—(Crowe 599)
3 knobs—(Crowe 6126)
"A" battery—1½ volts (Eveready 741)
"B" battery—45 volts (Eveready 482)
Case—See text for dimensions

so it was necessary to cut a slot on the top of the chassis and set it down in about ⅜". If a case of the size specified is used, however, this is not necessary and the speaker may be mounted directly on the top of the chassis. Two screws in front and a bracket at the rear hold the speaker securely.

The only tricky part of construction came in the dial and vernier drive arrangement. A so-called planetary drive unit was cut short and sweated on to the condenser shaft. The dial was removed from an old midget receiver. As a matter of fact, a vernier drive is really not necessary, as tuning is not too sharp. A simple dial glued to or drawn on the face of the case, with direct drive, will be very satisfactory and save a great deal of "fussing."

Mounting of parts is quite simple and wiring is the final chore. When finished, it should be

Above: The openings in the front of the case for the loud speaker and the tuning dial are readily cut with a sharp knife.

checked with the greatest care. Flexible leads are used for all battery connections and for leads to the loop antenna. The former terminates in plugs that fit in corresponding sockets on the batteries, making battery changing a matter of a minute or so.

Alignment is best accomplished with a service oscillator, although, if a powerful broadcast station is nearby, it may usually be used. At any rate, the first step is to set all four trimmers on top of the I. F. transformers, (L2, L3) to the point giving maximum signal. The I. F. is 465 kc.

The loop antenna should have four turns removed from its outside edge before it is installed. Place the receiver, batteries, and loop on the bench in the same relative positions they will occupy in the case, then proceed with alignment of the oscillator trimmer on the gang condenser. The trimmer for the detector section should be left wide open, and the front of panel antenna trimmer, C2, set about one-half open. With the main tuning condenser wide open, the set should operate at

There isn't much empty space inside the "pee-wee" portable! When the cover is closed, the sponge rubber pads press against the "A" and "B" batteries and keep them securely in place.

about 1,600 kc., and a definite point of resonance must be had with C2. Next, fully close the gang condenser, and adjust the padding condenser to resonance.

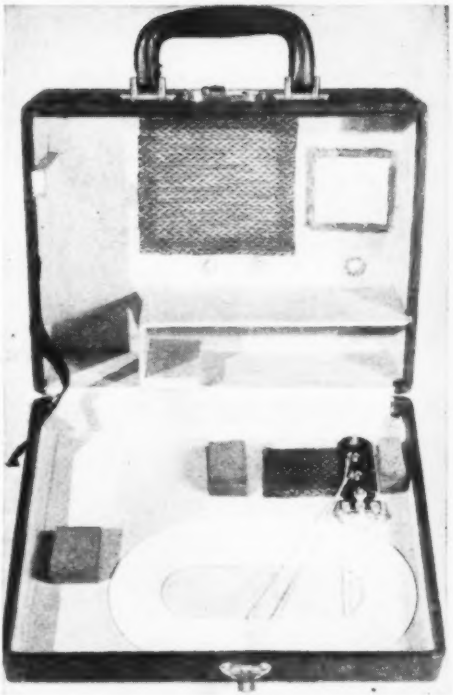
The above operations are entirely standard procedure, and if the builder has not the equipment or experience to do them properly, a service man will perform the job for very little. The main point to remember is that all the parts must be in the same positions they occupy in the case. This is especially important in the case of the loop antenna.

The antenna trimmer, C2, is a luxury not found on commercial sets. For ordinary local reception it need not be touched, as it may be left in the same position no matter where C1 is set. However, for distance work it is invaluable, and it is also useful when an antenna and ground are used with the set.

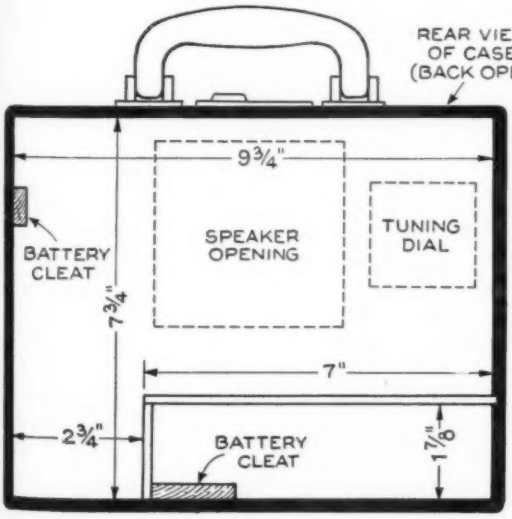
A slot 2½"x1¼" is cut in the lower rear of the case, with a small terminal strip across one end for antenna and ground connections. The rest of the slot is left open for a speaker rear vent.

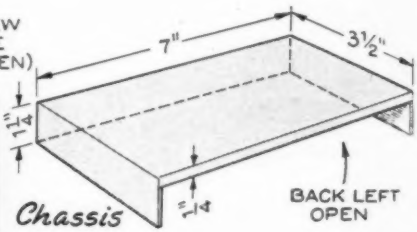
Incidentally, it should be noted that the normal bottom of the make-up case is used as the *front* of the finished receiver, while the original case top becomes the receiver *rear*. This makes it very easy to get into the case for battery or tube changes.

Holes for the dial and speaker are cut in the case and the latter covered with grill cloth. It was found adequate to hold the chassis in place by two nuts, one over the bushing of C2 and one over the front of the earphone jack.



Above: Appearance of the inside of the case of the "pee-wee" with the chassis and the batteries removed to show the shelf arrangement. The black ribbon on the left prevents the cover from dropping open too far. Below: Chassis and case dimensions. The latter are subject to some variations, depending on the size of the particular case that is used for the receiver.





The loop is simply glued into the cover of the case. Blocks of sponge rubber fastened inside the cover with rubber cement hold the batteries firmly in place and prevent shifting.

After this outfit has been in use we feel sure the reader will agree that it is outstanding in performance.

Dynamic Balancer For

The photo at left shows the balancer in operation, checking a V type cone pulley. Note chalk in background.

Balance in shop machines is essential if excess bearing wear is to be avoided and if accurate work is to be turned out. Instructions for the construction and operation of this dynamic balancer include descriptions of all the processes necessary to assure a smooth running shop with low upkeep.

by Walter E. Burton

THE dynamic balancer shown in the photographs was built for the purpose of curing jitters in a floor-type drill press. The cone v-belt pulley on the motor shaft was discovered to be out of balance. That is, heavy on one side. With the aid of the balancer, which is simple to build and use in spite of its imposing name, the pulley was cured of its palsy. Response of the drill press to this treatment was almost startling. Where there had been a lateral vibrating movement of the table of .030 to .040 in. before, there was, after balancing the pulley, only .002 or .003 in. displacement.

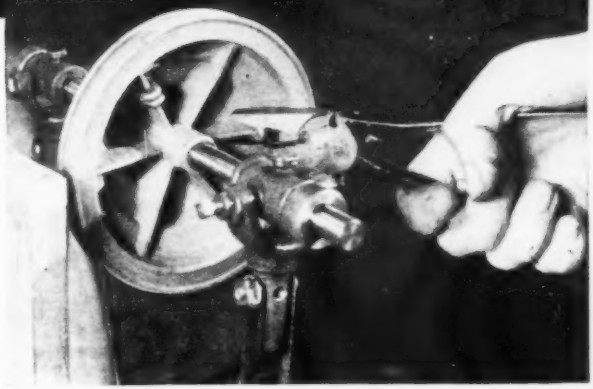
Although designed primarily for motor and other machine pulleys, the balancer can be adapted easily for use with motor and generator armatures, gear wheels, flywheels and other rotating parts.

Briefly, the dynamic balancer shown consists of a horizontal shaft ½-in. in diameter running in bearings that are mounted on the upper ends of vertical springs. A small, variable speed sewing machine motor furnishes the power for rotating the pulley mounted on the shaft.

The base is a rectangular piece of scrap lumber 1-in. thick. About midway between the sides, and toward one end, a sliding strip made from ⅜-in. plywood is arranged as shown. Two narrow strips nailed to the base form guides, and a bolt projecting from the base coincides with a slot in the plywood piece. With a wing nut, the block can be anchored in any position within the limits of movement. This enables the distance between springs, one of which is mounted on the block, to be varied to accommodate motor armatures or shafts of different lengths. For use only with pulleys, the adjustable feature is not necessary because a long enough piece of shafting can be used to take care of any pulley it will fit.

The vertical springs are made from old 10-in. hacksaw blades, four blades to a spring. Ream out the blade holes to receive ¼-in. bolts. The lower end of each spring rests in a slotted maple block. A ¼-in. bolt, passing laterally through the block and the holes in the blade ends, secures the blades firmly.

Bearings shown were obtained at a dollar store. They are of a type used for small line shafts. They are adjustable vertically, and the part used is the movable half consisting of a forked casting with setscrews that engage the bearing proper. Holes ¼-in. in diameter drilled through the base of the fork enable each bearing to be bolted to the top of its



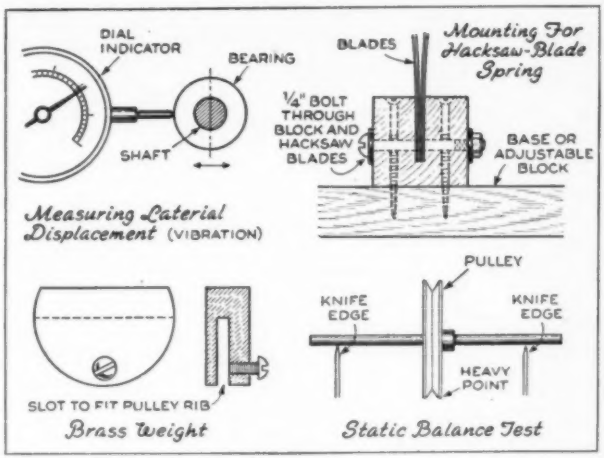
Right: Pressing small pieces of wire-solder into place with a pair of pliers to effect a temporary state of balance.

spring. Divide the number of hacksaw blades in half by putting an equal number on each side of the bearing support. If you find that the sidesway of the balancer is too great, you can likewise divide the lower ends of the blades, putting half on each side of the supporting block instead of using the slot arrangement. When drilling the holes in the bearing bases, if an adjustable plywood block arrangement is used, make one ⅜-in. higher than the other. This brings the bearings on a level plane.

The shaft is equipped with a pair of collars to limit the end movement. Adjust the collars so the setscrews are opposed, to insure shaft balance. The motor is mounted on the base, with its shaft directly below the pulley shaft. If the motor vibrates much, insulate it from the base, or mount it on a separate support. Use a very light belt. An ordinary wrapping string is sufficient in most cases. The motor should be, preferably, of variable speed. Pulleys out of balance usually will vibrate most at certain speeds. The vertical stick of wood shown, with a horizontal piece at the top, is optional. It is handy for steadying the hand when using chalk to find the light spot of the pulley.

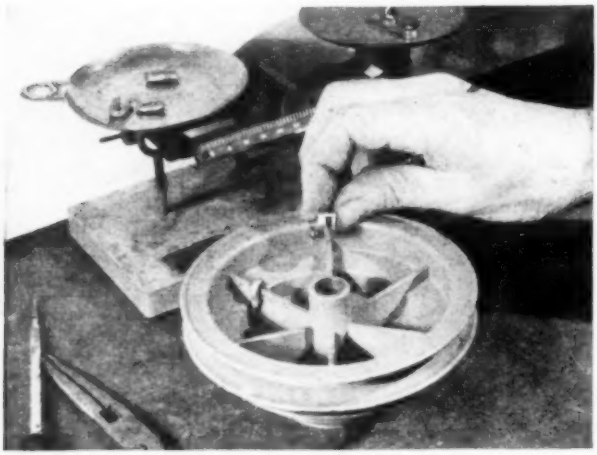
To use the balancer for treating a jittery pulley: If necessary, put the pulley on a lathe and true it up first. Then mount it on the shaft, connect the belt, and set it spinning. You can estimate the extent of vibration quite closely by observing or touching the shaft bearings; or you can put a dial gauge against them and measure the lateral displacement which, in mild cases of unbalance, may be 0.010 in. or more.

Below: This drawing shows the correct method of testing a shaft for lateral displacement, and other points of balance technique.



Next find the position of the "light" spot, which will be opposite the "heavy" spot. There are two ways of doing this, and both should be tried as a check against each other. (1)—Hold a piece of chalk close to the edge of the pulley, and move it inward gradually until the pulley edge strikes it lightly. Stop the pulley and observe where the mark is. (2)—Remove the pulley and shaft from the balancer, and subject them to a static balance test by letting them ride between two *level*, parallel knife edges, or two lengths of ½-in. shafting placed parallel and level. The heaviest side of the pulley will swing to the bottom

Here is a close-up view of the hacksaw blade base, the sliding adjustment, and the type of bushing and mounting to be used in the top.



Permanent weights are made after the temporary lead ones are removed and carefully weighed. The lead ones should not be left on.

in the knife-edge test. And you may be surprised to find that the chalk mark is on top, on the lightest spot! This indicates that the pulley was rotating about a point near the center of mass instead of the axis of the shaft.

Now that you know where the lightest and heaviest portions of the pulley are, the next operation is to apply balancing treatment. Replace the pulley on the dynamic balancer and attach a small weight at or near the lightest spot. Or you can drill away a bit of metal near the heavy spot. The exact type of weight you can use, and method of fastening it will depend on the pulley design. When there are spokes or ribs, U-shaped lengths of wire solder crimped into place with pliers are excellent. It may be necessary to distribute the weights among two or three spokes before the vibration is reduced effectively. The solder weights will stick in position at moderate speeds, especially if a little beeswax is used to tack them down. However, for actual service, a more permanent arrangement is necessary. It might be feasible to stick the weights tightly enough with some wax or other adhesive. But a better way is to make little weights that are equipped with setscrews or other means of reliable anchoring. These can be made of brass or steel, and filed or machined down until their weight is that required to effect balance.

When wire-solder U's are crimped on the pulley ribs as shown in trial-and-error balancing, they can be removed and weighed on a chemical balance, to provide a standard for making permanent weights. Always, after fastening weights in position for use on motor or machine, check the dynamic balance before putting the pulley into service. And always make sure the weights are anchored securely. Even a small one shot into space by centrifugal force can do a lot of damage. For this reason, drilling metal away from the heavy spot often is the preferred treatment, but not always the possible one.

The method described for balancing a pulley can be used for motor rotors and other rotating parts of machines. The chalk-mark operation cannot be used when the circumference is not a true circle concentric with respect to the shaft; but static balancing will save the day. For a heavier balancer, power hacksaw blades, automobile spring leaves or even wooden strips can be used as springs. Main requirements are stiffness to support the load combined with ability to swing laterally.

Such a balancer as that described may be the means of converting a noisy, shimmying shop machine into a sweet-running one.

Copyright TBW

Los Angeles To London—Dawn To Dusk!

[*Continued from page 39*]

perhaps 40 cylinders, hiding them within the wings and cooling them by liquids or by air forced in under pressure. All engines will be easily available to mechanics for service during flight. Geared propellers will be turned by large shafts supported by the wing structure. Whereas the big transports cruise now with engines turning at 2,000 r.p.m. (2800 top speed), in another five years they'll cruise at 2500, with a top of 4,000. Our power plants are getting faster, too!

Meanwhile, takeoff and landing speeds, thanks to modern flaps, will remain practically the same as today, increasing only 10 miles or so above the present speed of 65-75 miles an hour.

Now let's shift our gaze into the crystal ball for a preview of the years immediately following 1945. I see a wing, smaller in area and highly swept back, yet lifting a weight of 70 tons or more. Propellers will be mounted on shafts protruding from the trailing edge, pushing the plane forward. We will approach a step nearer the flying wing, a much-discussed design which will not leave the experimental stage for many years. Some form of stabilizing medium, tail in front or behind, is dictated by problems of control. The fuselage may disappear entirely as the wing thickens.

We're still shooting at 746 miles an hour. Can we pass the speed of sound and other limitations set up at high speeds? Suppose we consider the flight path of a bullet. Its drag coefficient increases greatly when the projectile hits the compressibility speed; but, and this is important in considering the possibility of an 800-mile-an-hour projectile which we call the airplane, if the bullet has enough power to break through that invisible wall, its flight becomes much more normal once again.

You'll hear more about compressibility speed in the future. Exactly what does the term mean? Let's say you are flying at 500 miles an hour. Due to the fact the wing has a finite thickness and the air to get around it must travel somewhat faster with relation to the wing, it flows over the surface at, say 575 miles an hour. Perhaps the air picks up an extra 200 in dodging around the corner of the carburetor scoop, which brings it to 700 miles an hour. When you reach the compressibility speed, the air cannot move in behind the structure as rapidly as the plane is moving. In effect, this creates a vacuum which tends to hold the plane back.

Well, we visualize the 800-mile aircraft. How to break through! If our engines do not develop enough power to crash the gates, we can dive the plane at an angle of 15 or 20 degrees to pick up speed and thereby pass through. Having attained a velocity exceeding the speed of sound, we level off and continue normal flight.

It is unlikely that planes as we know them today will achieve such a startling performance . . . thirteen miles a minute. These 800-mile ships will partake of the nature of rockets. At higher speeds we will consume the "pig's squeal" from exhaust gases. On planes making only 400 miles an hour (sounds slow, doesn't it?), by directing the exhaust gas straight back, we can pick up another 20 miles. So rapidly does the rocket effect increase that directed ejection on a 500-mile airplane will give it an 8-mile per hour boost.

Now, let's ask ourselves a question: If the rocket seems so effective, why not utilize a smaller engine for the takeoff, then eject the gases for propulsion at high speed? This opens an entirely new field of thought, and suggests that the power plant may become an inefficient gas burner, providing a rich mixture which may be ejected while still burning to provide all the power necessary.

One interesting possibility meanwhile is the combination gasoline-steam engine. The two engines are inter-connected, both turning the same crank shaft. Because of incomplete combustion, exhaust gases from the gasoline engine may be passed through a boiler to provide steam which is fed back into other cylinders which aid in turning the crankshaft. Forty per cent of the potential power from gasoline now escapes through the exhaust. Perhaps the steam plant will provide a way to both economy and more speed.

Gasoline turbines, too, are entirely practical. Already three or more gas turbines have been run experimentally. Principal problem is the discovery of proper light weight, heat-resisting materials from which to manufacture them.

We stand at the dawn of developments in aviation which will make our swiftest ships of 1940 look more out of date than the first plane ever to take wing. No more romance, no more pioneering to be done? Aviation's future holds opportunities at which my bold predictions do not even hint!

New Drug Helps Teeth

Success in the treatment of abscessed teeth with the chemical remedy, sulfanilamide, was reported by Dr. Fred R. Adams, of New York, at the Greater Philadelphia Dental Meeting in Philadelphia.

One injection directly into the abscess of a hot sulfanilamide solution killed all the trouble-making germs in every case but two, Dr. Adams reported. One case required two such treatments and another, three. Some of the abscesses that were cleaned up in one treatment had persisted for 10 years. X-ray pictures of these cases showed that after a few months new bone had grown to fill the area formerly occupied by the abscess.

New Organization Promotes Model Railroad Building

Scale model craftsmen who build railroads in their spare time are now eligible for membership in the International Brotherhood of Scale-Craft Model Railroad Builders, a new organization developed to promote interest in this popular hobby.

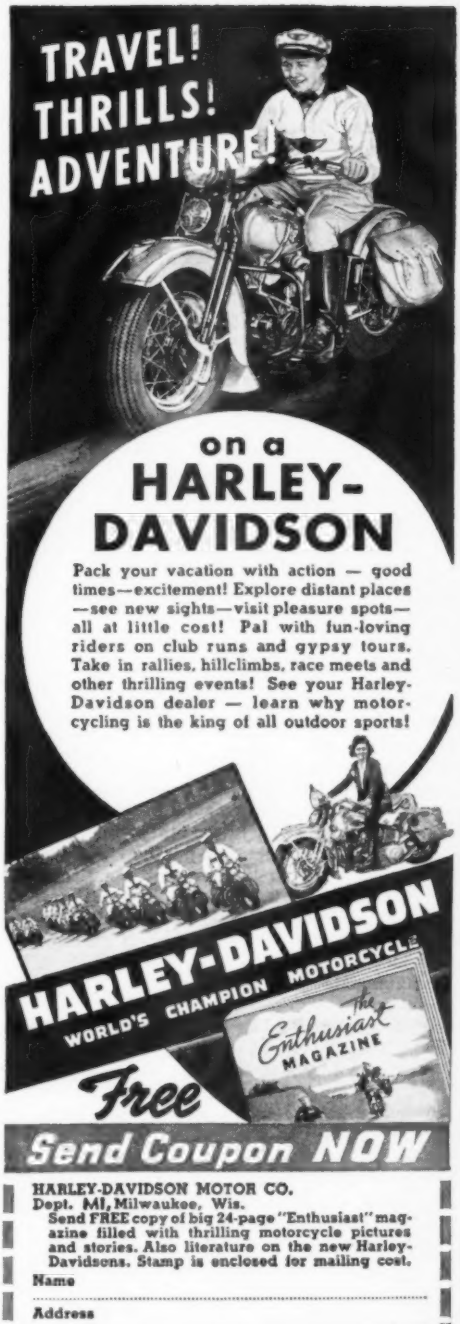
Although membership will be limited to people who actually build up their own models from parts, the beginner will be entitled to membership as soon as he has purchased material to start work on his first car. New members will be given, free, a membership card and button and a regulation engineer's cap, with the compliments of the model railroad equipment dealers who have been authorized to certify membership applications.

Honorary Member No. 1 of this new Brotherhood is the well-known engineer of the famous Santa Fe "Chief," Jim Leary, who was presented with his membership card, badge and a fresh, new cap as he climbed into his cab for a western run from the Dearborn Station in Chicago. Elliott Donnelley, of Chicago, founder of the Brotherhood, who made the presentation, predicts that 1940 will see the formation of hundreds of local chapters of the Brotherhood among the model railroaders of the country. "A unique feature of the Brotherhood," said Mr. Donnelley, "is the fact that the members pay no dues. All the interested fan needs do is to go to his local model store and ask for details. As soon as he starts the actual construction of his road, the dealer will see that he is awarded the little red card that signifies membership in the Brotherhood."

Lighting experts believe that illumination of heavily traveled and hazardous highways would save 5,000 lives a year in the United States.

Scottish troops no longer wear kilts in fighting because the kilt is poor protection against poison gases.

Roughening concrete road surface by applying hydrochloric acid, to reduce skidding risks, has been tried experimentally in England.


TRAVEL!
THRILLS!
ADVENTURE!
on a
HARLEY-DAVIDSON
Pack your vacation with action — good times—excitement! Explore distant places —see new sights—visit pleasure spots— all at little cost! Pal with fun-loving riders on club runs and gypsy tours. Take in rallies, hillclimbs, race meets and other thrilling events! See your Harley-Davidson dealer — learn why motorcycling is the king of all outdoor sports!
HARLEY-DAVIDSON
WORLD'S CHAMPION MOTORCYCLE
The Enthusiast MAGAZINE
Free
Send Coupon NOW
HARLEY-DAVIDSON MOTOR CO.
Dept. MI, Milwaukee, Wis.
Send FREE copy of big 24-page "Enthusiast" magazine filled with thrilling motorcycle pictures and stories. Also literature on the new Harley-Davidsons. Stamp is enclosed for mailing cost.
Name
Address

Diving For Undersea Films!

[*Continued from page 49*]

way and discharged a blast of air from his helmet. A stream of air bubbles surged upward and the sharks chased after them. The knowledge that sharks charge after anything that moves probably saved Nohl's life, in this instance, for it headed off the man-eaters and he was able to get to the surface unmolested.

Such experiences were avoided thereafter by the use of a pneumatic rifle containing a 2,200-pound pressure cylinder of compressed air, which fires 24-inch spear-headed steel darts, more than a match for any shark. These weapons have saved Nohl from sharks many times, but usually a blast of air from the gun, producing a cloud of air bubbles, is enough to frighten off sharks, octopi and barracudas.

Among the 3,600 known wrecks surrounding the islands of the West Indies are innumerable Spanish Galleons, lost while carrying gold and silver to Spain about 300 years ago. Nohl has located and filmed the remains of five of these wrecked galleons, half-buried with ooze and sand on coral reefs. Her treasure buried sealed under tons of sand, the *St. Christopher*, a galleon lying 300 feet down off the north west coast of Haiti, revealed its name, bones and spars for Nohl's camera. He penetrated the shark-infested waters and filmed the killers over the wreck, ready to attack, while his aides held them at bay with pneumatic guns.

Nohl's ultimate plans include the salvage of the old Cunard liner *Lusitania*, sunk off the Irish coast in 1915 with $5,000,000 aboard, as well as many of the ships already sunk in the present war.

Working on a Hollywood assignment at the moment, he is aiding in the production of the first full-length underwater movie, the entire action having an ocean floor locale. For this purpose, Nohl has designed and built the largest diving bell in existence. It weighs twenty tons, measures ten feet in diameter and thirteen in height, and accommodates movie equipment and twelve persons.

Operating much like the Navy's rescue diving bells, Nohl's bell is self-buoyant and must be pulled down by a cable previously secured to the bottom by a diver. When an emergency arises, an automatic release on the winch inside the bell lets the cable run out, and the bell rises to the surface.

Twelve portholes, or portlights, distributed around the half-inch steel shell provide ample vantage points for the cameras to shoot through. The air supply, self-contained, originates from six tanks, each containing 2,200 pounds air pressure, sufficient for 72 hours. A huge cannister purifies the air, chemically removing carbon dioxide and transforming it into limestone.

Nohl is best known for his feat in breaking the long-standing 307-foot diving record set by Frank Crilley, U.S.N. Nohl, using a new type of diving suit which he perfected himself, descended 421 feet to the bottom of Lake Michigan, on December 1, 1937.

Correct Answers to Quiz on Page 65

1. True.
2. False. Metempsychosis is another term for transmigration of souls, an occurrence believed by ancient Egyptians to take place after death.
3. True.
4. False. The femur is the thigh bone.
5. True. An ampersand is the symbol "&" for the word "and."
6. True. An airplane could fly directly east, making several trips around the earth.
7. False. Nicotine is a colorless liquid with a very decided taste and smell.
8. False. Female wolves are known as wolverines.
9. True. 44c and 49c.
10. True.
11. False. Orchids grow from seeds.
12. True. Wootz is a kind of steel. An oolly is a lump of steel as it is removed from the crucible.
13. False. A radial engine is so named because the cylinders radiate from a common center.
14. False.
15. True.
16. True.
17. False. A landing strut is part of a plane's undercarriage.
18. True. Explosive rivets are used on certain planes to make joints in inaccessible parts.
19. False. An aerostat is a lighter-than-air craft.
20. True.
21. False. The spinning motion assures a more accurate trajectory.
22. True.
23. True.
24. False. A humming bird is a bird.
25. False. A balloon jib is merely a large jib.

Attention, MI Readers!

We will pay $1 for each true-false statement which we find acceptable. Statements will not be acknowledged or returned. Address the Quiz Editor, MECHANIX ILLUSTRATED, 1501 Broadway, New York City.

Checks have been sent to the following: W. S. Ellington III, Nashville, Tenn.; Willard Augustine, St. Thomas, N. Dak.; Clay Miller, Jr., Jackson, Miss.; William Cambo, Derby, Conn.; S. J. Sabin, Montreal, Canada; Havelock Rowland, Seattle, Wash.; Walter Miller, Greenville, N. H.; Edgar Linton, Kansas City, Mo.; William Galloway, Throckmorton, Tex.; Roland Ryder-Smith, Seattle, Wash.; Michael Sovin, Wilkes Barre, Pa.; Sergio Say, Manila, Philippines; Edward Lambert, Detroit, Mich.

Germany's Secret Weapons

[*Continued from page 67*]

existing 15-inch naval gun. Whether the range has actually been pushed up to 135 miles, nearly doubling that of the Paris guns, is another question. It might be done, by greatly increasing the powder charge. That, of course, would certainly shorten the life of the gun through erosion.

The flying tank, suggested as another likely weapon in the expected drive against England, was predicted in this magazine as long ago as 1930. There is no doubt that Germany possesses planes in quantity which could be used to transport light tanks across the English Channel. To transport heavier types of tanks a special plane would be required and might take the general form illustrated on this page. Planes would land on previously captured airports, unlimber their tanks or combat cars and fly back to the main tank base to pick up another load. Field guns could be similarly transported.

The gasoline-filled glass bomb was suggested by a recent report that German planes in attacking small surface craft off Dunkerque dropped gasoline or other inflammable oils on the water and then ignited it with tracer bullets. The bomb as shown here would be of fairly thin glass, light enough at least to guarantee complete breakage on touching the water. The bombs would be self-igniting, probably by means of a small contact fuse attached inside the bomb at the tail end. No fins would be required, as these bombs would be scattered rather than aimed at any particular target. Bombs of this type would wreak havoc in busy waterways and harbors by setting up a field of flame over the entire area subjected to attack.

Iodine Still Best

First aiders should use tincture of iodine as an antiseptic for cuts, leaving mercurochrome to the physician. This advice was given, in effect, by Dr. Leonard J. Piccoli, professor of pharmacology, Fordham University, and American Red Cross first aid instructor, at a recent meeting of the American Pharmaceutical Association.

Tincture of iodine, his laboratory studies show, is at least three times more powerful as an antiseptic than the aqueous solution of mercurochrome found in most first aid kits and in family medicine chests. The 2% acetone-alcohol solution of mercurochrome used by physicians, however, is relatively as efficient as tincture of iodine, Dr. Piccoli found in his tests.

A British botanist who recently collected potato varieties in South America found Bolivian potatoes that resist 22-degree temperature.

Most hoofed animals have horizontal eye pupils, possibly an aid in spying enemies while grazing.

Make More Things at Home with

KESTER METAL MENDER

You'll get a real kick out of increasing your skill as a craftsman with Kester Metal Mender. You can build more things and make them better when you have a can of this handy home solder on your work bench. Time and again you'll find that the easiest way to make it is to *solder it!*

And the same thing goes for repairing anything made of metal. Kester Metal Mender contains its own flux and makes perfect, money-saving repairs every time. All you do is apply heat and the job's done.

Buy it at your hardware or other stores.

For a sizable free sample of Kester Metal Mender and "How-to-Use-It" Booklet—*mail coupon now.*

KESTER METAL MENDER

•••••••• **You Can Paste this Coupon on a Postcard** ••••••••

Kester Solder Company, 4252 Wrightwood Ave., Chicago, Ill.
Please send me free sample of Kester Metal Mender and "How-to-Use-It" Booklet.

*Name*_____

*Address*_____

*City*_____ *State*_____

•••••••••••••••••• **Mail the Coupon Now** ••••••••••••••••••

Your Job—Accounting

[*Continued from page 71*]

accountants who get their start in government service and later accept positions with private industry where their specialized knowledge is more highly paid.

Municipal and government accounting are other specialized fields in addition to the broad and extremely varied field of general business.

You naturally will not get your start as a specialist, but as a bookkeeper or junior accountant whose work is mostly routine, whose salary is not high in dollars but is rich in experience. The junior accountant works under the supervision of the senior accountant who, as a rule, is too busy to do much training of subordinates—he expects the junior to have adequate background and to learn under his own steam.

While much of the work a janitor does is routine detail, he is picking up immensely valuable experience on how businesses are run. Moreover, his work throws him in close contact with higher executives. Budgets and appropriations call for conferences with advertising and sales managers, production men, and top officers of the company. Of course it is the senior accountant who carries the heavy burden of responsibility, but since the junior man does a great deal of the "spadework" on accounting problems, he usually sits in at important conferences.

Have you ever done a bit of debating or do you like to engage in discussions for your own amusement? Not the kind of argument in which voices are raised and tempers lost, but hard-headed, factual discussion which has nothing to do with table-pounding? That's a fine attribute, for as a top-flight accountant you will have to hold your own in conferences. You should have the ability, summed up in the colloquial phrase, to "stand up on your hind feet and holler."

Not literally, of course. But suppose, as an accountant, you know a great deal about a business which certain of its executives do not. Suppose you are accountant for a paper mill and have to deal with a sales manager of the type mentioned a few paragraphs back. You have to persuade him that it is unwise to flood the mill with orders and you must make him see why.

That requires the ability to express yourself in good English, with a good vocabulary. Even more, it requires an understanding of people and how to get along with them. An accountant should be hard-headed but he shouldn't be hard-shelled. He should like to meet and influence people, but at the same time he should have the introvert's ability to concentrate and deal with theory.

"What kind of a background should an accountant have?" is a question of great importance to the young man in the process of acquiring background.

He should have, at the minimum, high school education or equivalent. Bookkeeping experience is good but not at all essential to the study of accounting. He should have an interest in office work and a liking for legal, economic, and business knowledge. Exact and logical studies, such as physics and algebra, should appeal to him. He should have an ability to grasp theories, such as those he will encounter in studying physics, for such practical jobs as the installation of an accounting system for a new business is largely a matter of theory applied to specified conditions. And his fund of general information should be in keeping with his high intelligence.

Accounting is especially suited to spare time study while holding down a daytime job. Aristocrats in the training field are colleges of business administration which issue degrees equivalent to those bestowed on lawyers. Such an education is unquestionably excellent, but just as costly as any other college training—$500 a year for a four-year course is the absolute minimum and costs are much more likely to double that figure.

Not even an accounting college graduate is automatically entitled to the coveted C. P. A. degree—but more of that later. Neither is he exempt from the absolute necessity of practical experience before starting up the ladder. Ideally, practical experience should go hand in hand with accounting study.

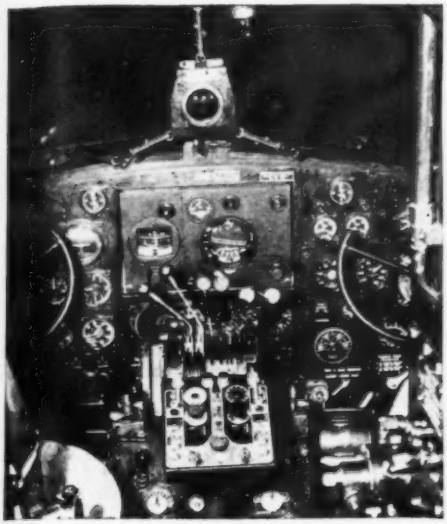
"The best advice I can give a man who wants an accounting career," says one widely-known public accountant, "is to take as many different office jobs in as many different businesses as he can. Hold one job six months, then go on to another. You'll be getting basic business experience while you're studying advanced accounting in your spare time."

Business law, accounting theory, auditing, installation of systems, cost accounting, tax accounting, are some of the subjects taught in accounting courses. Any fair-sized city has one or more business colleges, usually with no special entrance requirements, that teach accounting methods. The quality of training varies and it is wise to check the standing of such schools with your local Board of Education, which will also inform you of night schools or other courses which may be available in your community at moderate cost.

Correspondence study is better suited to accounting than to any other subject, with the possible exception of drafting. Accounting *is* bookwork and paper work. The correspondence student is given typical problems to work out, actual books to maintain, and the questions he cannot answer are discussed by his correspondence teacher. The value of such a course is immensely increased if the student is working at a bookkeeping or accounting job, blending practical experience with theory. A representative mail order course in accountancy, C. P. A. problems and business law costs $190 and, on the average, takes 1,200 hours to complete. Special courses in Cost

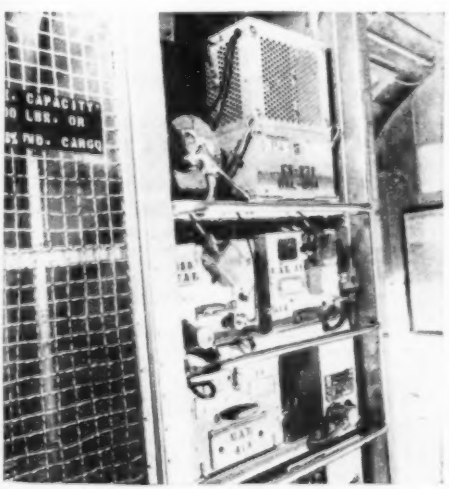
[*Continued on page 134*]

Airliners Centralize Radio



Developed by the communications laboratory of the United Air Lines, this centralized radio control and equipment saves weight and simplifies radio operation for the pilot. The control panel operating the radio is shown in the upper photograph. Its location behind the engine controls, between the control wheels, brings it within easy reach of either pilot.

The equipment operated from the panel is also concentrated. A rack built into the cargo compartment houses the entire group, saving the weight of extra wiring, and simplifying repair.



EVERYTHING IN RADIO
ALLIED RADIO
ALLIED'S NEW 1941 RADIO AND PARTS CATALOG
212 PAGES JUST OUT!
FREE
EVERYTHING IN RADIO AT LOWEST PRICES!
65 NEW RADIOS
The 1941 RADIO HITS you've been waiting for! Knockout values—new Plastic models, world-wide sets—new "Camera" and 3-way Portables; 1941 low-cost Phono-Radio-Recorders, Combinations, Auto Sets, Amateur receivers—48 pages of models for every purpose at new low prices!
SOUND SYSTEMS
Sensational 1941 Public Address Systems—for every P.A. application. 7 to 75 watts—new features, new ideas, new low prices. Time Payment Plan—15 Day Trial Offer. Complete listings of mikes, speakers, phono equipment, recorders, etc. —all in a big special 35-page P.A. section.
MORE THAN 15,000 RADIO ITEMS!
BIG MONEY-SAVING BARGAIN SECTION!
Learn Radio
BUILD WITH ALLIED KITS
Allied's RADIO BUILDERS HANDBOOK
Build your own radio set, transmitter or radio device—learn while you build! Dozens of new, low-cost easy-to-build kits; new diagrams—more than 15,000 quality parts. Free matched parts lists for building any circuit. Learn Radio quickly, easily with ALLIED's help.
Send for this RADIO BUILDERS' HANDBOOK—a valuable beginner's book on radio; tells how to select circuits, read diagrams, build sets, etc. Easy to understand; well-illustrated; helpful. Order by coupon below. Only ... 10c
ALLIED RADIO
CATALOG FREE Send this Coupon!
833 W. Jackson Blvd., Dept. 6-J-1
Chicago, Illinois
☐ RUSH me your FREE 1941 Fall Radio Catalog.
☐ ENCLOSED find 10c. Send me the "Radio Builders' Handbook".
Name .....
Address .....
City ..... State .....

Your Job—Accounting

[*Continued from page* 132]

Accounting and Junior Accountancy are available at lesser figures.

Practical experience in itself is not enough for an accountant; neither are any of these education methods. It is the *combination* that gives professional standing. Textbooks in accounting offer another excellent method of getting the necessary education. If you find it difficult to learn from books, hard to extract the meaning from technical writings, it is probable that you don't have the fundamental instincts of an accountant at all, for books are his very staff of life.

Frequent mention has been made of the C. P. A. degree and a fuller explanation is in order. The title of Certified Public Accountant is issued by each state to public accountants who pass stiff tests very similar to bar examinations. The requirements vary for each state and you can learn what they are by writing to the State Board of Accounting at your own state capital.

In general, the requirements are good moral character, high school education, and a specified amount of experience. In practice the test is not usually taken until the accountant has rolled up several years' experience, not even college training is enough in itself. The tests are intentionally tough for the responsibility of the public accountant is so great, in the issuance of balance sheets and stock sales statements, that the public must be protected. Only one out of five men passes the C. P. A. test at the first attempt, but it may be taken as often as desired and about half of those who were unsuccessful at the first try pass on the second attempt.

"Accounting is the best paid profession in the world," is the flat statement of one authority who cites figures to prove his case. He was speaking of averages, of course, for there are plenty of accountants with very moderate incomes—perhaps because their aptitudes suit them better to other jobs, or because their technical abilities are not backed up by qualities of personality already discussed. But this authority had in mind the fact that good earnings commence earlier in accounting than in such professions as medicine and law, which ordinarily have a period of slim pickings after the shingle is hung out. Moreover, good earnings continue until very late in life, for the accountant is a brainworker and though he may slow down physically with age, there is an actual increase in professional skill because of accumulated experience.

As a non-certified junior accountant you may start out at around $25 a week, in business or government employ, but before long should reach a salary status of $10 a day or $3,000 a year. The average C. P. A. or senior accountant just about doubles these figures—$20 a day or around $100 a week.

In general business, the sky is the limit for an accountant's salary. Walter S. Gifford's paycheck has run up to more than $250,000 a year. With higher salaries, of course, one's title is not likely to be accountant, but comptroller or treasurer. Incomes of $5,000 to $10,000 a year are common in such positions, and very frequently run much higher.

The problem of landing a job is relatively simple for a good accountant. For the C. P. A. the problem hardly exists. Business needs accountants on a constantly increasing scale, and when you are qualified you are automatically trained for a *particular* kind of job—not the "just anything" of most jobhunters that bores personnel men to distraction. We are not speaking here of ordinary bookkeeping jobs, such as keeping up a cash journal, which requires no great amount of skill, but of those which classify as accounting work.

Aside from the fact that accountancy is a key position leading to advancement in business faster than any other method, it appeals to the individualist who likes the idea of going into business for himself. The public accountant is, as a rule, a free-lance working with clients just as a lawyer does. Even while learning there is usually the chance to make money by keeping books for small concerns during spare time. Many accountants make more money by taking care of the accounts of several small firms than they would by working for a large corporation.

The possibilities open to an accountant are so varied that any man who rates well on the aptitude test, and who "can take it" by applying himself to hard study, stands a splendid chance of solving his career problem to his complete satisfaction.

Income Chart for ACCOUNTANTS

Beginner with some accounting training (beginning wages vary with amount of training and nature of the specific business, but this figure is the ordinary minimum)	per week	$25
Junior accounting, with training and experience	per week	$50
	per day	$10
Senior accountant	per week	$90-$100
	per day	$20
Non-certified private accountant	per year	$3,000
Average Certified Public Accountant	per week	$100 up

Numerous minor executive jobs of an accounting nature fit in the wage range of $45-$60 per week; more responsible accounting posts, such as assistant auditor, range around $100 per week; positions such as comptroller or treasurer (usually attained around the age of 45 years) fall into the $5,000 to $10,000 per year classification and may frequently exceed these limits.

Radio "Hams" Have Distinctive Call Letters

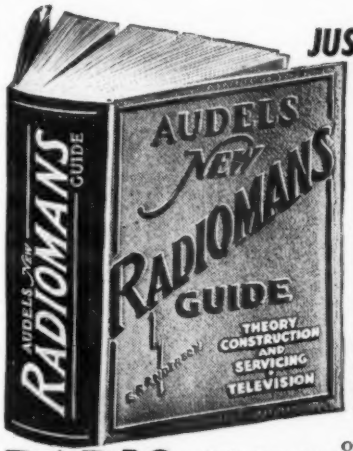
Someone recently mailed the Federal Communications Commission a newspaper clipping of an item headed, "W9CHD BECOMES BRIDE OF W2MSC." The account referred to the marriage of two radio amateurs who operate stations bearing those call signals. It attested to the interest of "ham" operators in their distinctive radio calls. Commission policy is to not reassign amateur calls so long as the alphabet permits allocation of new call signal combinations. This tends to avoid confusion of records, as well as giving each amateur a particular call. The Commission's files contain other instances where amateur stations have merged in the sense indicated above—also cases where such combinations have later parted!

To a California man who inquired about the number of amateur licenses, the Commission reported that the figure is approximately 55,000, which roughly represents both amateur station licenses and licensed amateur operators, although the two classes of licenses differ in number slightly for various reasons. By way of example, in some households there are two or more licensed amateurs but only one station, whereas in some instances an amateur has two stations.

Still explaining about amateur operation, the Commission points out that amateur licenses do not require any specific schedule of operation and the amateur is free to discontinue activity at any time. Many amateurs are constantly experimenting and changing their equipment, and for these and other reasons the number of stations active in any particular time is not known. A test area survey by the American Radio Relay League some years ago led to the conclusion that the number of amateur stations on the air during one month was about a third of the licensed number.

The Commission has received several letters objecting to war news over the radio, or criticising it as "biased." An Indiana man wants the "Government radio station" in Washington, D. C. (non-existent!), to give daily war news broadcasts. A New Jersey man offers his services to the Commission as "a commentator on European news events." A New Yorker would "like to get in touch with the Commission's television casting director." Obviously, the Commission has to reply that it has no jurisdiction in such matters.

A telephone subscriber writes about rates in connection with the proposed introduction of dial service in a New Jersey city. His point is covered by State regulation, so he is referred to the New Jersey Board of Public Utility Commissioners. By the same token, a Virginian who proposed to construct a private telephone system located wholly within his State is informed that the Communications Act expressly exempts the Commission from authority over local exchange and intrastate communications service.



JUST OUT!

EVERY RADIO MECHANIC —Service Man and Student Needs "Audels Radiomans Guide" Just Out! The wholesubject of Modern Radio covering the Basic Principles—Construction and Operation—Service—Repairs—Troubles—All Easily Understood Over 750 Pages.

RADIO $4

400 illustrations. Parts and Diagrams—LATE TELEVISION DATA—Valuable for REFERENCE AND HOME STUDY

To get this practical information in handy form for yourself just fill in and mail coupon today.

COMPLETE • PAY ONLY $1 A MONTH!

THEO. AUDEL & CO., Publishers, 49 W. 23rd STREET, N. Y.
Mail AUDELS NEW RADIOMANS GUIDE for free examination. If O. K. I will send you $1 in 7 days; then remit $1 monthly until price of $4 is paid. Otherwise, I will return it.

Name _____
Address _____
Occupation _____
Reference _____ MM

BALKO
NEW 1940 No. 11 CATALOG (SECOND EDITION) NOW READY
CATALOG No. 11

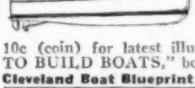
Better Tools-Lower Prices
GET BALKO'S 1940 CATALOG!

THE CATALOG OF EVERYTHING IN POWER TOOLS, SPRAY EQUIPMENT, MODEL SUPPLIES, ELECTRIC MOTORS, Metal Lathes, accessories, Artist Air Brushes, Spray Guns, Elec. Bench Grinders, Grinding Wheels, Lathe Chucks, Micrometers, Pulleys, V Belts, Carving Tools, Compressors. BALKO'S complete stocks and fast service save you time and money. Send a 5c stamp today for your big new copy.

BALKO ELECTRIC TOOL & SUPPLY CO.
605 W. Washington, 9-B, Chicago

FULL SIZE CUT-TO-SHAPE BOAT PATTERNS

Design No. 155
22 FOOT SEDAN RUNABOUT



Also Blueprints and Complete Specifications

Newest designs by Naval architect. Cruisers, runabouts, sloops, snipe, outboard boats, sailing canoes (Kayak), etc. 8-38 ft. Surprisingly low prices. Rush 10c (coin) for latest illust. catalog. Send $1 for "HOW TO BUILD BOATS," book postpaid.

Cleveland Boat Blueprint Co., Station A-23, Cleveland, O.

Saw-Filing

Pays up to $2 or $3 an Hour in Spare Time

A FOLEY Automatic Saw Filer files hand circular and band saws better than the best hand filer. Cash business, no canvassing, no eyestrain. No experience needed. Louis P. Wadowick, Ohio, says, "I have filed 764 saws in spare time and have earned $850.00 in carpenter work due directly to my saw filing contracts." Send coupon for FREE PLAN, no obligation.

FOLEY MFG. CO. 917-40 Foley Bldg. Minneapolis, Minn.

Send Free Plan on Saw Filing business.

Name _____
Address _____

"Bonnie," 18-Ft. Cabin Sloop

[*Continued from page* 119]

about ⅛-in. deeper than from chine to sheer, to allow for the slight extra thickness of the bottom planking. By following the method just outlined, you will have no difficulty in cutting an accurate and professional-looking rabbet. The deepest part of the rabbet is only one-half inch, making the operation a very easy one.

Make a final checkup of the contours of the hull before starting to plank.

Planking the Hull

Thanks to the use of Super-Harbord marine plywood, the process of planking is reduced to its lowest common denominator. The speed and simplicity of planking a boat with this material is amazing, as you will find out once you get started.

The sides are covered first, two pieces to each. Get out your roll of building paper and make two patterns for the side; a full 12 ft. one and another to cover the rest of the length. On one side use the short piece at the bow, on the other side at the stern, thus staggering the joints. Allow the pattern to come about ¼-in. above the chine and below the sheer. Place the patterns on the ⅜-in. plywood sheets (see drawings for cutting arrangement) and run a pencil line around them. Incidentally, when planking with plywood it is not necessary to allow much seam; 1/16-in. is plenty at stem and keel, less than that at butt joints. Cut out the panels and clamp them in place on the sides. They will bend easily without heating. Drill holes for 1¼-in. No. 8 flat head brass screws; 5-in. centers along frames and sheer, 3-in. centers at chine and stem. Remove the panels after all holes have been drilled and brush away the sawdust and chips underneath. Open your can of liquid marine glue and swab it plentifully along the chine, stem and transom. Coat also the corresponding edges of the panels, on the underside only. Now take strips of cotton flannel (you should have previously obtained some of this material at a department or drygoods store and torn it into 3-in. strips) and lay them along the gluey chine, stem and transom. Replace the panels with clamps, and turn in the screws until they are just below the surface of the plywood. When all pieces are on tight (you will see the glue squeeze out) plane the edge that projects above the chine until it is beveled even with the latter. Follow the exact same procedure to plank the bottom, placing flannel and glue along keel, chine, stem and transom. It will be necessary, however, in the case of the bottom to put both short panels at the bow, as a 12 ft. length is too hard to manipulate into the stem. Put in the bow panels first, clamping the aft ends to keelson and chine, then working the forward ends gradually down to the stem. You will have to use the hot towel treatment on these half-inch pieces in order to ease them into the twist at the bow, but this is a very easy task. Simply heat a large pot of water over the kitchen stove until it is boiling. Place a big bath towel on top of the panel and slowly pour the boiling water over it, until you can feel the warmth with your hand on the underside of the wood. Whip off the towel and push the end of the piece down toward the stem. It will take plenty of gimmick (the assistance of a husky friend or neighbor is advised) but you will be surprised at how much more yielding the heat treatment has made the plywood. The water itself has no effect on the plywood—it is the *heat* that softens the binder. When the panel has been forced to the stem put in several screws quickly to hold it. You now have it subdued, and the rest is routine. The two long bottom panels will go on as easily as the side pieces. Space the screws at 2-in. centers along the keel and stem, 3-in. along the chine and transom, 4-in. on the frames. By this time your enthusiasm should have reached a new high, as you gaze upon the completely covered hull.

Bevel the edges of the bottom planking until they are flush with the sides and transom. Butt blocks may be put in at this time. In the original *Bonnie* left-over scraps of frame lumber were used for this purpose (1⅛ x 2¾-in.) but still better would be pieces of oak about ¾ x 5-in. Set the butt blocks in flannel and marine glue, fastening with double rows of screws spaced at 3-in. intervals.

Next, cover all screw heads with Kuhl's trowel cement and fill the seams along keel, stem and butt joints with elastic seam compound. Caulking is unnecessary. Mark the waterline as shown in the plans, using a heavy pencil and a long batten, with a taut string rigged along the hull for a guide. Sand the bottom smooth and apply two coats of copper bottom paint, red, green or bronze, coming just up to the waterline.

The boat is now ready to be turned over and you will need to make a cradle for it to rest on. The actual method used in the turning will vary according to where the construction is taking place and the facilities at hand.

BILL OF MATERIALS, "BONNIE"

FRAME LUMBER

(Finished milled sizes as delivered)

Keel—1 pc. yel. pine ⅞"x3"x16'
Keelson—1 pc. yel. pine ¾"x7¾"x16'
Sheer battens—2 pcs. ⅞"x1¼"x19' w. oak
Chines—2 pcs. ⅞"x2¼"x18' w. oak
Frames—60 lin. ft. 1⅛"x2¼" w. oak
Deck beams—1 pc. w. oak ¾"x5¼"x12'
Stem—1 pc. yel. pine 3"x6"x6'
Mast step—1 pc. w. oak 3"x6"x8"
Mast pardner—1 pc. w. oak 3"x8"x8"
Transom frame—1 pc. w. oak ¾"x3"x12'
Transom knee—1 pc. w. oak 2"x7¼"x3'
Breasthook, stern knees, 1 pc. w. oak 1¼"x8"x2'
C. B. bed logs, 1 pc. 1¼"x3¼"x10' w. oak
C. B. trunk ends, supports, cabin framing—30 lin. ft. 1⅛"x2¼" fir.

[*Continued on page* 137]

"Bonnie," 18-Ft. Cabin Sloop

[*Continued from page 136*]

Deck framing—2 pcs. w. oak ¾"x2¼"x18'
Cabin roof, 1 pc. w. oak ½"x1¾"x12'; 35 lin. ft. ¾" sq.
Hatch slides and ends—2 pcs. mahog. ¾"x2¼"x10'
Moulding—50 lin. ft. 1" mahog. half rd.; 30 lin. ft. ¾" quarter rd.
Tiller—1 pc. w. oak or mahog. 1⅛"x2¼"x4'
Mast—1 pc. Sitka spruce 3"x4"x28'
Boom—2 pcs. spruce ⅞"x2¼"x12'
Engine stringers—1 pc. yel. pine 2"x2"x8'
Engine bed—1 pc. w. oak 2"x8"x6'
Skeg—1 pc. w. oak ¾"x3¼"x3'

SUPER-HARBORD PANELS

Side planking—1 panel 48"x144"x⅛", fir
1 panel 48"x96"x⅛", fir
Bottom Planking—2 panels 48"x144"x½", fir
2 panels 48"x96"x½", fir
Decks and cabin roof—1 panel 48"x144"x⅜", lauan one side
hatches, joinerwork
1 panel 48"x72"x⅜", lauan one side
1 panel 36"x144"x⅜", lauan one side
1 panel 36"x72"x⅜", lauan one side
Cabin sides, coaming—1 panel 36"x144"x½", fir
Cabin front, back, doors—1 panel 48"x96"x½", fir
Rudder and C. B. trunk—36"x144"x¾", fir, 1 panel
Transom and Gussets—1 panel 48"x144"x¾", fir
Note: There will be enough waste from above to take care of most of interior work in cabin and cockpit.

FASTENINGS

2 gross fl. hd. 2" #10 screws, brass or galv. Fig. No. N521
6 gross fl. hd. 1½" #10 screws, brass or galv. Fig. No. N521
6 gross fl. hd. 1¼" #8 screws, brass or galv. Fig. No. N521
1 gross fl. hd. 1" #8 screws, brass or galv. Fig. No. N521
1 gross fl. hd. ¾" #8 screws, brass or galv. Fig. No. N521
Carriage bolts, bronze or galv.—14, 4½"x⅜"; Fig. No. N506
—18, 6"x¼"; 7, 7"x⅜"; 4, 2"x⅜"
Lag screws—12, 3"x⅜"; 6, 5"x⅜". Fig. No. N513

FITTINGS & HARDWARE

Item	*Quantity*	*Fig. No.*
Portlights, 6"	2	N432
Boat cleats, 5" open base	5	N478
Bow chocks, 4"	1 pr.	N485
Straight chock 4" (stern)	1	N487
Mooring bitt, No. 2	1	N497
Pintles, ¾"	2	N526
Gudgeons, plate	2	N528
Rigging turnbuckles, 5/16" dia.	6	N531
Sheet traveler	1	N556
Sail track, ⅜"	35'	N5513
Gooseneck, No. 1	1	N564
Chain plates, 8"	4	N572
Lip leaders, ½"	2	N5710
Masthead sheave, 2" dia.	1	N589
Stemhead plate	1	N591
Clew outhaul	1	N599
Headboard snap shackle, No. 1	1	N601
Fast eye block, No. 6	1	N629
Swivel eye block, single, No. 5	2	N6211
Centerboard block, No. 1	1	N625
Galv. rigging wire, 3/16" dia.	150'	N334

PAINT, ETC.

2 qts. copper bottom paint; ½ gal. Jeffery's C quality liquid marine glue
½ gal. yacht white
½ gal. top grade spar varnish; 1 qt. liquid red lead
1 pt. Kuhl's trowel cement
2 lbs. Kuhl's elastic seam compound;
Mahogany stain & filler

Above Figure numbers refer to the catalog of Armstrong & Galbraith, 623 6th Ave., N. Y. City, who stock all items listed.

This completes the first installment of *Bonnie*. Next month's article will deal with the construction of the deck and cabin. Large scale blueprints and patterns will be available after publication of Part II in the October MECHANIX ILLUSTRATED.

SAVE REPAIR COSTS WITH P.W.

Plastic Wood has 1001 uses in the home and workshop. Handles like putty, hardens quickly to permanent wood. In cans or tubes at Paint, Hardware, 10¢ Stores.

PLASTIC WOOD

FREE TRAILER PARTS CATALOG

Complete Plans and Building Instructions 10¢

We'll save you money on — axles, springs, wheels, couplers, windows, sinks, water pumps, brakes, refrigerators, beds, lamps, inside and out, 6V lamps, furniture, jacks—everything. Special discount to mfrs. NATIONAL TRAILER EQUIPMENT CO. Largest and most complete trailer builders supply house in the United States. Successors to Kar-A-Van Industries, Inc., Dept. M, 714 W. Wisconsin Ave., Milwaukee, Wis.

PHOTOGRAPHERS!

Have your rolls developed carefully and promptly by well-equipped Photo Finishers. See MONEYMAKERS & MONEYSAVERS (pages 27-32) for the names and addresses of these finishers.

BILD-UR-OWN

COASTERS · MIDGET AUTOS · SCOOTERS · BIKE TRAILERS, ETC.

BIG SAVINGS ON EVERY THING YOU NEED

NEW ROADSCOUT Scooter Complete $59

Equip your Scooter, Midget car, etc. with our Disc Wheels and Balloon tires. GOODRICH-GOODYEAR-FIRESTONE at lowest prices. We specialize in wheels, scooter kits, motors, parts, etc. Send 10c to cover cost of mailing book and Free Plans.

BILD-UR-OWN DEVICES 536 N. Parkside, Dept. MI-9, Chicago, Ill.

Wood workers: *Here it is!* Harold Hunt's 1940 catalog! Latest, UP-TO-DATE IDEAS for experts and amateurs; SPECIAL BARGAINS in rare woods, machines, and *all* kinds of supplies. Get posted! Send only 10c to CRAFTSMAN'S WOOD SERVICE CO., 2729 S. Mary Street Div. 2866, CHICAGO

only 10c

Phones Show A Profit In Fun!

[*Continued from page 51*]

phone when the subscriber gets into bed.

Founder and president of the concern, officially the East River Road Telephone Company, is Benton Minnich, 15-year-old-son of Professor D. E. Minnich, zoology department chairman at the University of Minnesota.

Chief engineer and mechanical genius of the organization is John Piccard, 19-year-old engineering student at the University, whose parents are the famed stratosphere explorers. Piccard solved a number of technical problems, such as avoiding the usual two wires per phone, main obstacle to expansion of the company's services. The company also has a vice-president, 11-year-old Jay Levine.

Benton and his partners combed junkyards and second-hand stores for supplies and eliminated the cost and the problem of overhead wires by stringing fence wires along trees. Permission for such stringing was obtained from the local alderman; the request was made on the eve of his re-election.

Main barrier to expansion at present is the increasing hum as new phones are added to each exchange. This is partly due to the variety of types of wire used. Until Chief Engineer Piccard solves this problem, the only method of handling it at present is to set up new exchanges.

This is one public utility which doesn't pay its own way. The officers agree that the income is a trifle less than expenses. They believe, however, that the public utility business is cheaper than stamp collecting and more fun.

Heaven In His Back Yard!

[*Continued from page 43*]

the fact that many severe earth shocks occur when the area is in a certain relative position to the moon. Few earthquakes occur in either polar region. This is thought to be due to the high pressure centrifugal force of the rotation of the earth's holding the strata in position. But neither does the full attraction of the moon ever reach directly upon the poles. It reaches on the more temperate zones, where the centrifugal force causes a natural bulge. The moon adds to this natural outward movement, and may cause a "trigger action" which is not wholly responsible for the quakes, but sets them off. If this should prove true—Murray warns it is not yet established—it may be possible to predict when quakes may come, and when there is little danger.

Many subsidiary instruments are needed in such a laboratory as this. Murray has built a rain gauge, a sun dial, not for telling time but for establishing position, and has many imposing instrument boards with humidity gauges, barometers, and chronometers.

Compartment Trays

[*Continued from page 93*]

B. The stock needed is shown in Fig. 5. Round the corners, fit it in the lathe and turn roughly down to the shape shown in Fig. 6, inside and outside. With a sharp round nose chisel carefully smooth up the inside, then work down the outside until the sides approximate ½ inch in thickness. Cut the partition (see Fig. 7) to slightly oversize. Sand and steel wool the bowl smooth, inside and out, ready for the final finish. Best results come if you use No. 000 in both sandpaper and steel wool with the lathe turning at a fairly high speed. Apply a liberal coat of clear lacquer, rub down with No. 000 steel wool when dry. Now fasten a block of pine to the bottom of the bowl with two screws (see Fig. 8), check carefully, and with one side of the block riding the fence, make several saw cuts to the depth shown in Fig. 6, so that the handle will just tap to a snug fit. Then glue in place.

The finished two compartment bowl is shown in Plate B.

A four compartment double box is shown in Plate C. Two identical turnings are made and the pieces squared, glued firmly together and sawed for the partition in the usual way. This partition is a piece of ¼-inch plywood, 3 or 3¼ inches high, cut to the shape shown. To reduce the weight of the box, the four outside corners may be sawed off if desired. The saw cut is made just deep enough to permit seating the bottom edge of the partition in a groove across the bottom of each inside turning. As a suggestion you might make this project of walnut or gum, and use maple for the partition for a two-toned effect. Fig. 10 suggests another variation of this design. The top edges of the two boxes may be chamfered if desired and in any event, should be rounded slightly with sandpaper. This holds true too, for the top edges of the partition-handle and the hand hole.

To show the almost limitless possibilities of this idea, glance at Plate D. Here are but two ways to lend variety and distinction to compartment bowls and boxes. Start with the stock shown in Fig. 11 and turn the box to a rough finish with straight inside and outside walls ½ inch thick. Fasten a pine block to the bottom and make two saw cuts, parallel, 2½ inches apart and just deep enough that a groove is cut in the bottom of the box 1/16 inch deep. Plywood ¼ inch thick can be used, or sheet metal, but since the box is lifted by the partitions, the ends must fit tightly or be glued in place. Drill holes 3 inches apart near the top of each partition and put in rope handles as indicated, with the knots facing each other. This comprises the three compartment box.

If you like either copper or aluminum trim on your projects, the idea shown in Fig. 12 will work well. Fold the metal sheet over an iron rod ¼ or ⅜ inch in diameter and press the sides together by pinching them with two wood blocks

[*Continued on page 139*]

Compartment Trays

[*Continued from page* 138]

in the vise. Make your saw cut grooves for them as usual, and then with the rod still in place, tap the double metal partition home. Then remove the rod. To securely anchor each end of each partition, turn a screw up through the bottom so that the point enters between the two sheets of metal. As the screw is turned home the metal is forced apart, thus thoroughly anchoring it in place. Instead of the straight sides of this box you can make a more ornate design if you wish.—*D. V. H.*

Modernizing The Sink

[*Continued from page* 96]

until the wood is in place, nailing as you go along. When the wood is bent, it is best to brace it, leaving the C clamps and braces on for six hours, wetting from time to time to prevent the wood from drying too fast and cracking.

Two plywood doors are used. Sand all edges well to prevent too snug a fit when the paint is applied. (See Fig. 6.) Before hanging the doors, it is best to put in the shelves. Only one is used here, it is of modernistic design having no visible supports. To fasten the shelf, nail a piece of one inch material on the wall. In this case, it is 18" high and in the center of the wall. The curve in front can be constructed in the same manner as was shown for the base. The shelf, in position, will be found to be strong as well as decorative. It was built in this manner to allow free access to the trap on the sink pipe in case of clogging. (See Fig. 7.)

The doors are now hung. Two friction catches are used to secure them in place at the top. The handles used here were made from a discarded car door pull. It was cut and filed as shown in the diagram. (See Fig. 8.) In painting, a good grade of enamel should be used. A black base line painted around the bottom, the same height as the toe-space, is not only more practical but adds materially to the general appearance.—*D. F. G.*

One Dollar Mantel Clocks

[*Continued from page* 101]

Some suggested harmonious colors are as follows:

House design, house, light blue; windows, dark blue; roof, chimney, and roof over windows, red; shutters and fence, yellow.

Castle design, roof, red; rock wall and center front section, light blue with dark blue details; towers and small roof over middle window, yellow.—*R. L. F.*

Hungarians are making "rice," it is reported, by removing the skin from wheat grains and adding fat and starch.

$5,000 WORTH OF BOAT PLANS FOR 50c!

If a boat lover were to go to naval architects and buy separately the plans in the new HOW TO BUILD 20 BOATS, they would cost not less than $5,000 for the complete set.

Yet the new 1940 edition of this outstanding book gives you those same plans for only 50 cents!

Every plan in the 1940 HOW TO BUILD 20 BOATS has been supervised by a naval architect, assuring you of absolute accuracy. Every plan is so simple and easy to follow that anyone who works with tools is sure to find a boat in this book which he can build at a fraction of the normal cost.

From plans in the 1940 HOW TO BUILD 20 BOATS you will be able to construct craft ranging in size from 7½ to 30 feet including sailboats, auxiliaries; inboard and outboard powered speed and utility designs, catboats, dinghies, etc. Get your copy today!

CUT OUT AND MAIL TODAY!

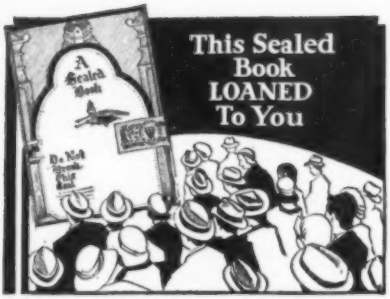
Fawcett Publications, Inc., MI-9
Greenwich, Conn.

Please send me, post paid, a copy of the 1940 HOW TO BUILD 20 BOATS. Enclosed find 50 cents in check, money order or stamps. (No coins.)

NAME .....

ADDRESS .....

CITY ..... STATE .....



THOUSANDS EVERYWHERE ACCLAIM THIS

New Psychology Of Life!

Have you unrealized hopes? Does the tomorrow of your ambitions and desires never seem to come? Are the better things of life always just beyond your reach?

Times have changed—but have you? Change your old form of thinking. Adopt a new psychology of life and MASTER YOUR PROBLEMS. It takes no greater mental effort to achieve results when you know how.

Let the Rosicrucians show you, as they have thousands of others, how by the use of simple laws you can apply the same powers of your mind to bring about startling changes in your life. If you are sincere in your desire, address a letter for the free Sealed Book. It will point out how you may obtain this most helpful information. Address: Scribe B.V.L.

The Rosicrucians
-AMORC-
SAN JOSE, CALIFORNIA.

Perpetuating the Ancient Rosicrucian Secret Teachings

MONEYMAKERS & MONEYSAVERS

(pages 27-32)

Here's a real Grab-Bag of exciting values for Hobbyists, Craftsmen, Mechanics, Photographers and general Bargain-Hunters. Don't miss this swell bargain-center. It's full of opportunities, services, hard-to-get-merchandise. Write your needs to the companies listed in this section, and your orders will be filled promptly.

Big Money for Workers In Home or Shop

MONEY-MAKING PROJECTS. Color-glazed concrete lawn, cemetery pottery made without molds or cores. New, patented method. Use only sand, cement, cheap materials. Tiles, walls, gravestones. Statuary, giftware. Basement waterproofing. Booklet, details, 3c stamp.

NATIONAL POTTERIES COMPANY
Dept. 8, 13 W. 26th St., Minneapolis, Minn.

Hollow Spars Easily Made

[*Continued from page 87*]

grooved reset the saw to give two other cuts inside these to make chiselling easier. Your spar plan or own ideas of mast making will show solid sections at certain points for strength, likely at the deck, in the way of spreaders and blocks, etc. In chiselling, leave such sections intact.

When glueing, fill cuts in these sections completely full of the glue. Clamp the two sides together and leave until set. Splices are, of course, glued and forced together at the same time. Only high grade waterproof glue should be used. Next comes final shaping and finishing just as you would with a solid spar. If there is much taper called for in the sides of the spar—and with these rectangular spars there seldom is, saw cuts must be planned to allow this to leave sufficient wall thickness at the top after dressing down the sides. The walls will be slightly thicker lower down where additional weight will not be a disadvantage.

A round hollow mast or boom can be made in much the same way: the secret is not to round the stick until after it is hollowed out. Shape it to the usual eight sides, laying out two opposite ones to be ⅛-in. wider than the other six to allow for the saw cut in splitting. This splitting is done with a bandsaw or large circular saw following carefully along a chalk line. Or at other times two pieces may be used, one to make each half, making splitting unnecessary. These hollow spars usually retain their diameter until well up and any taper toward the top is worked into the eight-square stick before splitting. Next set the bench saw to give outside cuts along either edge as shown and two deeper cuts inside these. As you reach the tapered section reduce the depth of the cut accordingly, the flat sides enabling you to keep the stick true on the saw bed and against the guide, an impossibility if the stick is rounded.

Then chisel out, leaving the required solid sections and filling cuts in these with glue. After glueing, the spar is rounded and sanded in the usual way.

Two pieces of wood glued together without fastenings of any sort have proven to be stronger than a solid stick, especially when grains are opposed. The hollowed sections allow for natural contraction and expansion of the wood thereby avoiding checking. The top should be finished with a neat wooden cap or truck which will prevent water finding its way down the end grain of the wood.

This method puts these usually expensive spars within the reach of anyone who is handy with ordinary tools and who will do the work carefully.—*J. A. E.*

Crude oil from oil wells is the source of about 450 types and grades of greases, asphalts, oils and other products.

Handy Anchor Cable

[*Continued from page 87*]

anchor cable, the rope passing up through the deck via a brass pipe, and made water-tight with a split tapered sleeve fitting tightly around the rope, and also in the pipe. The ring prevents the rope from getting away. An anchor of the folding stock, or navy type is good.

After passing to the bits for snubbing, the cable is run over a pulley anchor chock, which prevents rubbing of the cable when anchored for fishing, during meals, etc. This item is easily made of hardwood. This arrangement has been used very successfully on a 25 ft. cabin boat.—*B. M. I.*

Folding Deck Chair

[*Continued from page 89*]

construction and will outlast several of the cheap variety. The average craftsman can make one of these chairs in about four hours.

All stock is of nominal 1" thickness which is about ¾" full and all members are 1½" wide with the exception of the arms and these are 3" wide. Cut out these various pieces as shown, rounding all ends and edges. Aside from the pieces shown, five pieces of 1" dowel are required. Three of these are 20½" long and two are 19" long. These two pieces are inserted into the ⅝" holes in the diagonal pieces (3) by carving or turning down the ends as shown in Detail A of drawing. A small finishing nail is then driven into the connection after previously drilling a small hole to prevent splitting. The angles used on the arms may be bent cold from 3/16" x 1" wide strap iron (Detail C). These anglers are bolted to the underside of the arms with flat head bolts. Note that the anglers project from the edge of the arms. This is also shown in Detail C of drawing. Detail B shows the remaining connection which is a flat head bolt through two members and the end riveted over a close fitting washer. This riveting should not be so tight as to cause binding at the connection.

Stain and varnish all pieces before assembly, then tack a piece of canvas 18" wide and 26" long to the back pieces. Stretch this tightly and bind the edges before tacking in place. Similar material 17" x 19" is tacked between the seat dowels to connect the back and diagonal pieces. To make a lasting chair, maple or oak is suggested for the construction.—*R. T. M.*

Boat Trailer

[*Continued from page 90*]

made especially for this job. An automobile axle could be used if lengthened to give a tread of 71". Standard springs of suitable length will be satisfactory, about 36" long being advisable.

Tail light cable is laid inside the channel and taped.

Amazing INVENTION

RECLAIMS AND FILTERS MOTOR OIL AS YOU DRIVE!

SAVES
Car, Truck, Tractor Owners Thousands of Dollars Yearly

At Last! "RECLAIMO"—the amazing invention that RENEWS Motor Oil as you drive! ENDS FOREVER the wasteful, expensive and needless dumping of crankcase oil at regular intervals. Ingenious use of exhaust heat and filtering process automatically keeps crankcase oil clean and oily at all times! Actually removes gasoline dilution, corrosive acids, water and solids!

Makes Oil Changing Absolutely Unnecessary!

Unbelievable results and savings can be yours with the use of this revolutionary device. 10,000—25,000—50,000 and MORE MILES WITHOUT A SINGLE CHANGE OF OIL are everyday reports from owners of "Reclaimo" equipped cars, trucks and tractors.

GET THE FACTS! Mail coupon below or penny postcard for FREE 36-page illustrated booklet "Oil Facts." Contains the complete "Reclaimo" story (greatest advance in automotive history since the self-starter) and some of the most sensational "Oil" information ever presented to the public. ACT NOW! Send for your FREE copy TODAY!

OIL FACTS FREE BOOKLET

RECLAIMO MFG. CO.,
2306 N. Western Ave.,
Dept. 54, Chicago, Illinois.

"19,000 miles after I installed RECLAIMO and have not changed oil." J. E., Mt. Horeb, Wis.

"75,000 miles without an oil change. Installed RECLAIMO when car was new." J. F. D.'A., Cedar Rapids, Ia.

"RECLAIMO is all you claim it is; have not changed oil for 50,000 miles." C. N. A., Chicago, Ill.

"Never changed oil in my tractor. Cancelled an order for a barrel of oil." L. B., Earlville, Ill.

Full names and addresses on request.

U. S. Bureau of Standards "Oil does not wear out mechanically and may be used over and over again." (After reclaiming)

RECLAIMO MFG. CO.,
2306 N. Western Ave., Dept. 54, Chicago, Ill.
Without any obligation on my part, please send me your FREE Booklet "Oil Facts."

NAME .....

ADDRESS .....

CITY ..... STATE .....

Unconditionally Guaranteed—Moderately priced—"Reclaimo" saves its cost in few months' use. Sold direct and by reliable dealers everywhere.

TOOL & DIE MAKERS
Machinists, Screw Machine Men
EARN BIG PAY

Skilled metal workers earn up to $50-$60 a week. Learn these trades by actual work in ALLIED SHOPS. Fully equipped. State Approved. Low Fee. Enter any time. Day and Evening classes. FREE Employment Service. Write for NEW illustrated Catalog.

ALLIED SCREW MACHINE CO., (School Division)
Dept. MI-9, 609 W. Lake Street, Chicago, Illinois

Free Fall Catalog

Just Off the Press

Showing Hunting Footwear, Clothing, and fifty other leather and canvas specialties of our own manufacture for campers and hunters.

L. L. Bean, Inc.
282 Main Street
Freeport **Maine**

NOW ONLY $4.95

REAL ENGINE VALUE

Over 7,000 GHQ Gas Engine Kits were sold at $8.59. Over 15,000 sold last year. Now is your chance to buy the *New Improved* kit for $4.95. Absolutely complete with coil, plug, gas tank, instructions, etc. Send only $1. Shipped Exp. Coll. C.O.D. same day. Send for FREE literature or 6c for Jumbo hobby catalog. **DEALERS WANTED.**

½ Horsepower
All Parts Guaranteed

For Boats, Planes, Midget Cars, Etc.

ALL PARTS FINISHED—ONLY A SCREWDRIVER NEEDED
AVERAGE ASSEMBLY TIME 30 MINUTES.

FACTORY ASSEMBLED $6.95
READY-TO-RUN

GHQ MOTORS, 40A East 21 St., New York, N. Y.

KUNS' ILLUSTRATED AUTOMOBILE RACING BOOKS

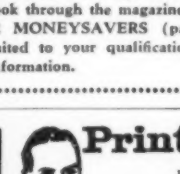
Tell you how to lay out and build high-speed engines, racing car frames and bodies. Complete, easily understood working drawings and building instructions. World's speed records. Complete details and illustrations world's fastest cars. Fourth Edition book deals largely with midgets. Fifth Edition covers dirt track racers and engine rebuilding. (Each book entirely different.) Order NOW—$1.00 each postpaid; $1.15 C. O. D.

RAY F. KUNS, Dept. A-21, Madisonville, Cincinnati, Ohio

OUT OF A JOB?

Be your own boss, and earn a comfortable living by picking any one of the innumerable business plans found on these pages. All types of work for all types of men! Just look through the magazine, including MONEYMAKERS & MONEYSAVERS (pages 27-32) for the business suited to your qualifications, and write away for more information.

Print Your Own



Cards, Stationery, Advertising, labels, paper, circulars, tags, etc. **Save money and time.** Sold direct from factory only. Junior Outfit $9.00. Senior outfits $17 and up. Do popular raised printing like engraving with any of our presses.

Print for Others. Big Profits

Pays for itself in a short time. Easy rules sent. Write for free catalog of outfits and all details.

KELSEY PRESSES, D-9, Meriden, Conn.

BIG MONEY BUILDING MEAD'S
New Portable OUTBOARD BOAT
IN A FEW DAYS AT HOME!

Write for **FREE** Circular

Build this light 50 lb. tough, durable, seaworthy **portable Outboard Ki-Yak!** Take it anywhere by hand or car. Safe, leakproof, trouble free. More speed per horsepower, more miles per gallon. MEAD'S perfected aluminum-ribbed, cut-to-fit construction Kit guarantees successful assembly quickly, easily, economically. New 65 lb. OK-4 uses oars, sail, motors, 9 h. p. or less. Also 2 "OK" paddle-sail models from 20 lbs. to 45 lbs. Double Paddle or Oars INCLUDED with your Ki-Yak! Write for FREE lavishly-illustrated circulars, low Factory-To-You Prices!

MEAD GLIDERS, 15 S. Market St., Dept. M-90 Chicago, U. S. A.

A Modern Magazine Rack

[*Continued from page* 113]

done, the rack will have a tendency to spring out of square when finished.

Walnut is ideal for the wood, but to save cost, you can substitute gum, birch or even white pine. Maple is also an excellent wood to use. If this is used, finish the pipe dark brown. The shelves are 10" wide, as is also the vertical end piece. The top shelf is 31¾" long, the next, 37¾" long, the bottom two are each 39¾" long. The length of each includes the 3¾" extension which is sawed on the back end to fit through the slots in the upright. After cutting these shelves to shape, sand smooth and finish.

Cut the slots in the end piece as shown in Fig. 4 so they will make a snug fit for the shelf extensions. Bore holes through the center of each of the upper shelf extensions just large enough to make a snug fit for the lamp support pipe. Through the extension of the bottom shelf, make the type of hole shown in Fig. 5. Bore the large diameter hole through the extension to within ¼" of the bottom. Remove this size bit and continue the hole with a smaller bit to provide a shoulder on which the pipe rests.

Turn two hardwood feet (see Fig. 6), for the lower ends of the side pipes, and the top for the lamp pipe, shown in Fig. 7. The latter plug has a hole bored through its center to permit screwing a threaded iron nipple into it to take the lamp socket. To hold this plug in place, drill a hole through one or two sides of the pipe as indicated and later turn in a small wood screw.

Indicate where screw holes are to be needed through the side pipes for the assembly screws. These can be bronze round head screws, or flat head screws which, if used, should be turned in with the heads flush. Reaming the holes will permit this. Turn in the screws through the side pipes half way for a preliminary check-up. See Fig. 8 for a side view. Glue the wood feet in the bottoms of the side pipes. Drive the screws home, checking for squareness occasionally. Drive a nail into the back vertical piece at an angle through each shelf end. Sink the heads and fill the holes with filler.

The final combinations of wood finish and color may be suited to the room in which the rack is to be used.— *Dale Van Horn*

Fertilizer Dispenser

[*Continued from page* 103]

A small hole is carefully punched in the bottom of the pail. The valve consists of a small dowel with the lower end shaped as shown. This runs up through a hole in the handle. When lowered, the rod seals the hole. Raising it for several seconds, according to the quantity of fertilizer wanted, permits the liquid to run into the hole in the ground.

Heavy Duty Tilting Head

[*Continued from page* 81]

to the bottom washer. Slip the 1½-in. bolt through the brackets and tubing and bolt in place with the wing nut. Now solder the tubing to the brackets, making certain the tubing is centered over the holes in the brackets. When soldering the tube to the brackets, turn the assembly on its side and fill in the cupped part of the window bracket with solder.

The top part of the tilting head is a duplicate of the bottom, except for the octagonal nut. The window brackets are soldered in place with the outside corners of the two brackets projecting over the edge of the washer 1/16 in. to increase the width of the space between them. The top washer and brackets will then fit over the bottom section with the upper brackets on the outside (see photo).

The thumb screw, available in camera stores, has a base about ⅜ in. thick. It fits into the upper part of the assembly and is prevented from falling out by the pin (a ⅛-in. piece of aluminum rod) pinched into position between the brackets in the upper washer of the assembly.

Now fasten the bolt head to the bracket with a dab of solder so that it won't turn when fastening or loosening the wing nut. The tilting head is heavy enough to hold a heavy 4x5 camera at a steep angle. When finished, it measures 2⅛ x 2⅛ in.

Fun With Camera At 1/250

[*Continued from page* 79]

heightened by shooting from a low camera angle. Then, by cropping the foreground from the finished print and leaving only the distant horizon, the illusion of extreme height is produced. Any high object that the subject uses to leap from should be cropped from the print to avoid betraying the method.

Because the model can only hold the pose he strikes in mid-air for a split second, syncronization between action and camera must be perfect.

The proper coordination of these elements will mean the success of your pictures.

A Home-Made Tire Pump

[*Continued from page* 108]

(A) and (B) remains. Take a valve (C) from an old inner tube and remove the nut and fitting that clamps the valve in the tube. Grind the base (D) down to the inside diameter of section (A) where (B) screws into it, and make a press-fit. A ¼" fibre washer (E) of the same diameter is assembled in the unit as shown. Then attach the tubing.

To operate this pump, remove one spark-plug and screw the unit in its place.—*S. W.*

A bargain in FILTERS

ONLY THE FINEST dyed-in-the-mass optical glass is used in Lafayette Filters. The filters are ground to insure faces absolutely flat and parallel. Colors are spectroscopically accurate. Here's great value! Use coupon to order.

COLOR	25 MM.	32 MM.	39 MM.
Light Yellow Medium Yellow Light Green Medium Green Red Orange	84¢ each	98¢ each	$1.19 each

FREE Filter Manual with purchase of 2 or more filters. FIFTY PAGES of values await the photographer in Lafayette's new Camera Catalog No. 81. Mail the coupon at once for your copy. It's FREE!

Lafayette Camera

NEW YORK • CHICAGO ATLANTA • BOSTON NEWARK • BRONX JAMAICA, L.I.

LAFAYETTE CAMERA
DEPT. 22JC—100 SIXTH AVE., NEW YORK, N. Y.
☐ I Enclose $..... Please Rush my order.
☐ Rush FREE Camera Catalog No. 81.
NAME .....
ADDRESS .....
CITY ..... STATE .....

CANDID BARGAINS NEW and USED CAMERAS AND ACCESSORIES Write To-DAY

SAVE MONEY!

Cameras (Movie or Still), Projectors, Photographic Accessories. Get our prices now. Trade-ins accepted—liberal allowances made. Write

NEW YORK CAMERA EXCHANGE
116 FULTON ST., NEW YORK CITY, DEPT. MX9
CAMERA EXCHANGE ORIGINATORS SINCE 1890

PUSH-BUTTON CONTROLLED
GAS TANK LOCK

ELECTRIC—OPERATES FROM DASH. NEW! SENSATIONAL! ELIMINATES KEYS. stops loss of gas and caps. Sold as standard accessory on the new GRAHAM CAR. A fast selling—high quality product at a new low price, year guarantee. If your dealer cannot supply you order direct. Distributors, dealers, HERE IS YOUR MONEY MAKING OPPORTUNITY. WRITE NOW for descriptive literature.
SNAP-UP GAS CAP CO., INC., DEPT. 5. ASHLAND, KY.

HANDEE
Tool of 1001 Uses

A WHOLE TOOL SHOP IN YOUR HAND

Smooth, steady power at your finger tips. Uses 300 accessories to grind, drill, polish, rout, cut, carve, sand, saw, sharpen, engrave, etc. Plugs in any AC or DC socket.

10 Days Money-Back Trial

Order today. Standard Model (illustrated) 18,000 r.p.m. 16 oz. $10.75 postpaid with 3 Accessories . . . DeLuxe Model 25,000 r.p.m. 12 oz. $18.50 postpaid with 6 Accessories.

Save Hours of Hand Work

FREE 64-Page Catalog
Complete information on Handee Products and their wide application in crafts work and industry all over the world.

Chicago Wheel & Mfg. Co. 1101 W. Monroe St., Dept. MI Chicago, Ill.

MYSTERIOUS DEVICE WELDS BRAZES AND SOLDERS
ANYONE CAN OPERATE

Now, an electric welding, brazing and soldering Torch, complete with power unit, goggles and supplies. **Works INSTANTLY off any light socket.** Does a thousand and one repair jobs at amazingly LOW COST on aluminum, iron, steel and other metals. **Indispensable** for Auto, Body and Fender Repairs, and home repairs—shop, factory, farm, engineer, janitor, sheet metal, radio and bicycle repairs. Anyone can handle without previous experience with our simple instructions. **10-DAY HOME TRIAL** Write at once for Special Introductory Low Price Offer. Try 3 in 1 Electric Torch for 10 days at our risk, and if not delighted return it. **ELECTRO-TORCH CO., 2613-LF, Michigan Ave., Chicago**

60 POWER TELESCOPE... $2.19

NEW! VARIABLE EYEPIECE 20X—40X—60X
Three telescopes in one. 3 different magnifications. 20 power for ultra-bright images with 40 and 60 power for extra long range. Guaranteed to bring distant objects, people, sports events, ships, moon, stars, etc. 60 times as close.

Most powerful made for anywhere near the money. Closes to less than a foot in length. Multiple lens system. 30 mm. objective lens. 5 sections. Directions included for using as a compound 4 lens microscope. American made. Prompt shipment guaranteed. We pay the postage. Only $2.19.
BROWNSCOPE CO., Dept. 79, 5 W. 27th St., New York, N. Y.

Earn Cash at Home!

We paid M. M. $1171 for exceptional "cellar crop" SNOW-KING mushrooms! Big free picture book tells if your cellar, shed, barn, suitable. We furnish materials, buy all you raise, guarantee starting crop. Write today for "Guaranteed Success Plan" backed by company established 1908—Twenty-five coast to coast branches.
UNITED MUSHROOM CO.
3848 Lincoln Ave. Dept. 482, Chicago

THE MAP OF THE WORLD CHANGES!

But you can keep your own private collection of yesterday's countries in stamps. Preserve for all time countries whose names are now disappearing from the globe. Start collecting stamps today. The reliable Stamp Dealers in our MONEYMAKERS & MONEYSAVERS Section (pages 27-32) will help you in this fascinating hobby.

INVENTIONS MANUFACTURED AT LOW COST! FREE ESTIMATES

Inventions manufactured in any size, any shape, any quantity, by old established (36 years old!) reputable company. (No branches anywhere). Also developing, designing, engineering, modelmaking, stampings, metal specialties, dies, models, etc. FREE estimates. FREE catalog giving "inside" information. Write today.
CRESCENT TOOL CO., Dept. T-SA, CINCINNATI, OHIO

Midget radio fits your pocket or purse. Wt. 6 ozs. Small as a cigarette package. Receives stations with clear tone. **PATENTED FIXED RECTIFIER.** Tubeless, Batteryless. Geared luminous color dial for easy tuning! **M. L. OF ILL. SAYS: "MIDGET RADIO WORKS FINE!"**
ONE YEAR GUARANTEE!
Sent ready to listen with instructions and tiny phone for use in homes, offices, hotels, in bed, etc. **SIMPLE TO CONNECT—NO ELECTRICITY NEEDED! SEND NO MONEY!** Pay postman only $2.99 plus postage and charges on arrival or send $2.99 (Check, M. O., Cash) and yours will be sent postpaid. A most unusual value. **ORDER NOW! FREE! PLUG IN "MAGICTENNA"—ELIMINATES OUTSIDE WIRES!**
MIDGET RADIO CO., Dept. M-9, Kearney, Nebr.

Sidewalk Snake-Scooter

[*Continued from page* 114]

and screw-eyes function as a semi-universal joint, permitting considerable movement to one side or the other. Construction is in the conventional manner, skate rollers on a two-by-four, with a handle bar mounted as shown. A light bumper of strap iron will come in handy on the pilot scooter, as will a brake on the "caboose." The brake is simply a pivoted, triangular board shod with strap iron and held off the sidewalk by a coil spring. Note that these scooters are easily uncoupled to be used separately.—*H. S.*

Pup Tent "Pent House"

[*Continued from page* 114]

across the bottom to form the floor. When the box is complete, hoist it in place and nail it to the support beams. Tie the ends of a rope to the trees, 4 or 4½ feet above the box, over which a tarpaulin or tent can be thrown and stretched. Tack the edge of the canvas to the outside of the box. A light-weight ladder or knotted rope is used so that it can be drawn up out of reach when the tent is occupied.—*G. E. V. H.*

Directional Stream Fan

[*Continued from page* 105]

is straight while the outer ends are curved. Cut the tin wide enough so when tacked in place, the sides will be far enough apart to allow the fan base to fit down between them.

Arrange it on the desk as shown. Start the fan and the breeze will be forced up and out where you will receive its benefit but the desk work remains undisturbed.—*L. B. R.*

Stained Wood Folding Table

[*Continued from page* 105]

carriage bolt through these pieces. A nut is not used on the bolt, rather a close-fitting washer is placed over the bolt and then the bolt is riveted over. This assembly should be firm but not too tight to hinge easily. Next affix the legs to the hinge pieces (4), as shown in Fig. 1. Next insert the dowel piece into the previously drilled holes in the legs. Screw the metal angles to the middle top piece, as shown in Fig. 2. Then insert a small finishing nail in the outside leg pieces through the dowel. Screw the two large top pieces to the assembly by means of the counterbored holes in the hinge pieces. All pieces should be rounded at edges and corners, sanded, stained and varnished. Fig. 3 shows the table folded and Fig. 4, ready for use.—*R. T. S.*

Toothbrushes from cocoanut shells are made by children in Java.

Salute TO THE BOYS AND GIRLS OF AMERICA

"Buddy" Brown, Gloria Jean and "Butch" Lenhart, appearing in Universal Pictures

FROM cover to cover and coast to coast, America's boys and girls—and their parents, too—are reading WHIZ COMICS, the comics magazine that has everything: Clean, wholesome adventure stories illustrated in exciting, full-color drawings and told in giant type that's easy to read.

IN gratitude for the ever-growing popularity of WHIZ COMICS—here's a salute from CAPTAIN MARVEL, World's Mightiest Man; GOLDEN ARROW, Robin Hood of the West; LANCE O'CASEY, Sailor of Fortune; SPY SMASHER, Relentless Foe of Enemy Agents; DAN DARE, World's Cleverest Detective; DR. VOODOO, White Ruler of the Jungle, and IBIS THE INVINCIBLE, World's Greatest Magician—ALL WHIZ STARS.

IF you want to make a hit with the family, take home a copy of WHIZ COMICS tonight. You'll give the folks a million dollars' worth of clean, thrilling entertainment for only a dime.

10c

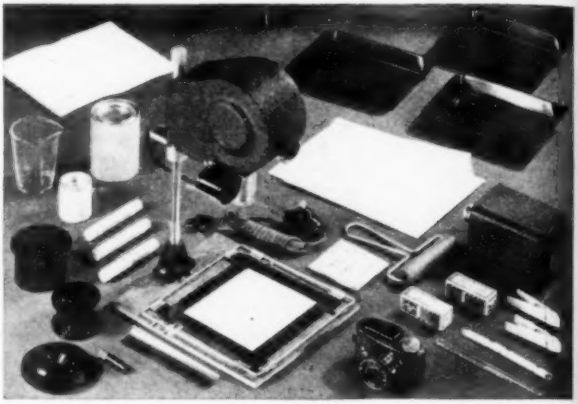
ON SALE AT ALL NEWSSTANDS

WHIZ COMICS

New Ideas for Home & Shop

Names and addresses of manufacturers of products described below will be sent free to any reader on request, provided a stamped, return envelope accompanies the inquiry. Mention date of issue when writing.

Ready made windows, complete with the glass, are now available. Made by a well-known manufacturer, they can be installed by one man in five minutes, with hammer and nails as his only tools.



A photographic kit now on the market contains everything necessary for the production of pictures, from camera to print paper. Even an enlarger is included in the set. Films, developing and fixing chemicals, tank, and trays are part of this complete combination of equipment. The outfit makes an ideal gift for someone starting out in photography.

The nails shown at the left are specially designed and are made of monel metal. Intended for boat building, their holding power is high.

A dainty tea time lemon squeezer that squeezes small portions at a time has recently been introduced. The design of the squeezer is based on a canary motif, the beak of the bird being a small snout from which the juice pours. Small sections of the lemon are inserted as needed.

A baby bottle saver is now being manufactured to prevent bottle breakage. The tendency of many infants to throw their bottles prompted the invention. Rubber strap grips bottle, and attached ribbon suspends it.

thing
print
de-
f this
ideal

man-
tage.
s to
e in-
ottle,
s it.